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Base-Exchange Resins

IT is not infrequently the custom of scientific men to announce important discoveries in cold matter-of-fact terms that serve effectually to mask from the uninitiated the value of the work. It was in the report of the Department of Scientific and Industrial Research for 1935 that these few lines appeared: "In conjunction with the Synthetic Resin section, condensation products of polyhydric phenols, and of bases, with formaldehyde, have been developed for removal of ions from solution, and for base-exchange purposes. A combination of phenolic with basic condensation products has been employed for rendering sea water potable." Thus was announced a quite remarkable discovery that certain synthetic resins would adsorb acidic ions from aqueous solution and that other resins would remove the basic ions, a combination of the two resins in series serving as an effective purification material for water. The research was at that time considered to have possibilities in the direction of purifying polluted water, such as contaminated wastes from factories, but it now appears to have produced a new class of bodies of general applicability in water softening also.

Like many discoveries, this one was in a sense accidental; it resulted not from a clearly defined series of steps, but as the result of a chance idea derived from independent work in another part of the laboratory. Messrs. B. A. Adams and E. L. Holmes, who were responsible for what has been described as "an entirely original idea," have been working on the subject at the Chemical Research Laboratory for some years. The process has now reached the stage of commercial exploitation, and we understand that two firms are interested, with one of which Mr. Adams has become associated, and with the other, Mr. Holmes. The process has obviously been launched as a commercial venture under the happiest of conditions. Mr. Adams addressed the London Section of the Society of Chemical Industry recently on the general subject of "Ionic Exchange by Adsorption on Synthetic Resins," and it is clear from his address that the rate of discovery has not been retarded by reason of the inventors' change from a more academic type of research to industry.

It appears likely that this type of base exchange takes place on surfaces. These synthetic resins, the zeolites, humus, active carbon and silica gel all appear to possess a polarity which attracts one-half of a molecule but not the other half. The similar reactions on humus, leading to acid and base exchanges in soil are highly important in agriculture. The general reactions of ionic exchange which only came into prominence a few years ago are now seen to possess a profound significance. The phenolic resins have acidic properties and it is these which form insoluble salts with bases and adsorb the cations; it has been found that only the polyhydric phenols when condensed with formaldehyde form resins possessing base-exchange properties, examples of suitable raw materials being tannic and gallic acids, sulphited quebracho tannin extract, pyrogallol, resorcinol and so forth. The anions are not adsorbed by these polyhydric resins.

These bodies are inexpensive and can now be produced for a few pence per pound. It is to be remembered that Sir Gilbert Morgan warned the Institute of Plastics that under present conditions we do not yet know what will be the price of plastic materials of this character made in bulk; it may be very small indeed. The significance of this remark is probably greater when applied to the resins which are used for adsorbing the anions, for these are considerably more expensive. These resins are basic in character and are made from *m*-phenylene diamine and similar bodies the cost of which is at present to be measured in terms of shillings per pound; these resins also require to be activated by treatment with an alkali before they will absorb such anions as chlorine.

By the consecutive use of phenolic and amino-resins it is possible to effect complete removal of dissolved salts from solution, yielding a filtrate equal to distilled water. In addition, the phenolic resins appear to remove bacteria from water and thus may have an important future in water supply. There is, however, the difficulty that the resins are slightly soluble in water; some resins are sufficiently soluble to make the water unfit for consumption, yielding perhaps 4 to 5 parts of organic matter per 100,000, but there is evidence that this disability will be overcome perhaps by the use of butyraldehyde instead of formaldehyde in producing the condensation product. Certain *m*-phenylene diamine resins have been prepared which are insoluble in water.

Their use has been suggested for rendering sea-water potable, and while this can be achieved in the laboratory, it is less successful in practice because it is necessary to revivify the resin by washing out the dissolved salts with water. The volume of washing water required after removing the salts from sea-water appears to be about equal to the volume of the sea-water purified. Mr. Adams suggested that the present practical limit is about 1/20th of the concentration of sea-water. The process is as yet in its early stages and there can be no doubt that developments will enable its applicability to be widened immensely and the cost to be reduced. Nevertheless, Mr. Adams was able to give the very satisfactory figure of 8d. per 1,000 gallons as the cost of softening 1,000 gallons of water from 45 parts of total solids per million to 3.2 parts per million, 1.7 parts of this last being silica.

Notes and Comments

Works Maintenance

THE prime object of a manufacturing concern, that of producing the highest quality goods at as low a cost as possible, can only be attained with any measure of success by a rigid control of overhead charges. A weighty item in the list of overheads is formed by expenses incurred in repairs and replacements to plant and plant accessories. These expenses should not be regarded as an inevitable part of the manufacturing costs, to be accepted without thorough inquiry, and with only a feeling of resignation. A most important part of the duties of works management is that of maintaining the plant in efficient working order with as little capital expenditure as possible; the effect which this has upon economic production should be fully appreciated. In essentials, maintenance is a matter of system forming part of the works routine. Jobs of inspection and overhaul, together with such periodical duties as oiling and greasing, should be allocated to certain men for carrying out on the requisite days. Plant operatives can report to the maintenance men any unusual occurrence in the function of the plant over which they have control. Numerous regulations have been made by the Home Office to guard personal safety in industry, and works are ardently encouraged to become "safety-minded." The idea might well be extended by the individual employer to include the safety of plant. In many cases the two are intimately linked together.

Less Restricted Foreign Lending

IF the bank chairmen put emphasis on one subject more than another in their annual reviews, it was on the urgent need of an expansion of Great Britain's export trade. No single factor is calculated to contribute more to that end than a relaxation of the present restrictions on foreign lending. Accordingly, Sir John Simon has gained nothing but approval for his announcement in the House of Commons that greater latitude will in future be allowed for three out of the four classes of foreign issues on which a Treasury Committee has been keeping a tight hold. The old restrictions continue to apply to any financing of foreign governments, states, or other public authorities, but the machinery of restriction is being eased for more strictly commercial lending, and more particularly for that which will make easier the financing of large export orders. For example, application by British borrowers for the purpose of acquiring assets or developing enterprise in foreign countries or for the acquisition of large blocks of foreign-owned securities, will receive more sympathetic consideration than hitherto. It may be hoped that this is the first step towards a much freer system of international trade than that to which the British manufacturer has been accustomed since 1931.

The Organisation of Research

THE value of research in industry has been clearly demonstrated in the past by the number of discoveries of extraordinary merit which it has produced. To-day, research in the chemical industry is regarded as a most telling factor in determining the success or otherwise of a manufacturing concern. As a result, the organisation of research is studied with a care comparable with that devoted to the planning of the routine details of production. An interesting article in the current issue of the I.C.I. Magazine by Dr. R. E. Slade, head of the Research Department of I.C.I., gives an insight into the way research is organised in an undertaking which spent some six million pounds on research during the past ten years. The Research Department at Millbank watches over the research activities of the groups, each of which has its own research department and laboratory, and is a subcommittee of the General Purposes Committee, to which it is responsible for all the company's research activities. Each group covers a section of the chemical industry. They are also advised by the Department of possible technical developments which may affect the respective sections. Mr. Slade outlined the type of research with which the groups are concerned. Primarily, work on the improvement of the efficiency of the manufacturing plants, then there is technical sales service which entails research into the problems of customers, and research on new methods of manufacturing the company's products. Research directed towards the discovery of new products and of their uses determines success in the future. Other duties of the research department are the maintenance of a complete technical library and patent section.

Oil from Coal in Germany

IN a recent letter to *The Times*, the Earl of Dunraven comments upon a number of indignant onslaughts, appearing in the Press, upon the very idea of producing oil from British coal. He draws a parallelism between this country and Germany, where, he states, the entire nation is united in a resolve to become completely independent of imported oil within a few years. The contrast is certainly very marked, but it is doubtful whether a true parallelism can be drawn between two countries with such different policies. Germany's aim is self-sufficiency *at any cost* and while it is true that she may be self-supporting as regards her oil requirements within the next few years, it has been estimated that it will cost her between five and six hundred million marks per year to do so. A similar situation occurs in synthetic rubber. Buna is being made in large quantities when it is admitted to be far more expensive than the natural product. It must in the end be a hopeless battle for any country which has only two principal raw materials in ample quantities to strive for self-sufficiency. Thus there is no real basis for comparison between our production of oil from coal and that of Germany. Our aim is economic production, and also the ability to adopt uneconomic processes in times of emergency.

Location of Industry

THE whole question of the location of industry, with special reference to the difficulties presented by the special areas, is a thorny problem at present under investigation by the Royal Commission on the Geographical Distribution of the Industrial Population. In evidence laid before the commission last week it was pointed out that in the past the individual industrialist had decided for himself where to establish his undertaking, but that the consequence of his decision did not end with himself. In the establishment of industrial undertakings the fullest attention should be paid to all the aspects, economic and social, of each case. The suggestion was made that a consultative body of an advisory character should be established for the purpose of informing the industrialist on these matters. Whether a Government department would be able to control the location of industry, and whether it is desirable that it should do so, is open to doubt, but the method of presenting all the relevant facts to the industrialist through a consultative body as suggested and leaving the ultimate decision to him, has a great deal to be said for it.

Maintenance and Chemical Plant Efficiency

By
"CONSULTANT"

ALL chemical plant has to be kept in good working order if it is to do what is expected of it, especially with regard to the rate at which material passes through a particular phase of processing, and that the ultimate yield of the product may bear an economical relationship to the quantities which originally enter into the process. This task of keeping the plant "fit for its job" is, collectively, spoken of as maintenance. It concerns every part of the plant inclusive of pipes, storage vessels, agitating gear, valves and other plant accessories, power transmission, electric motors, and boilers for the production of steam, together with all those individual reaction and processing units for physical operations such as crushing, screening, leaching, filtering, evaporating, cooling, crystallising, drying, etc.

The maintenance staff is responsible for all repairs, replacements and minor constructional alterations. It carries out a regular routine of inspection and attends to any repairs or replacements which are indicated. Some parts of the plant are continuously affected, as in the case of pumps, air compressors, electric motors, safety devices, valves and flange joints which may have to be broken on occasions during the operating life of the plant; other features, although demanding regular inspection, are less frequent in their actual need for attention. One and all, however, they are included in the policy of maintenance, for which a definite routine should be detailed to meet the needs of the works, and thenceforth rigidly adhered to. In some cases maintenance may actually merge into the plant operating procedure, because conditions may be extremely severe and necessitate the continual attendance of a fitter, who is not merely concerned with normal wear and tear as revealed by inspection. Even the work of cleaning down tanks where the process is a particularly dirty one, and the throughput of raw materials is notably large, could fall within the category of maintenance, because this regular routine may be necessary to avoid conditions which are either hazardous or liable to cause undue strain upon certain vital parts of the plant, which, in turn, by their failure or overload, may have ill-effect upon other more essential features.

Attention to Minor Matters

Incidentally there are many minor matters which continuously need attention and which, in the absence of attention, may equally well have serious consequences. For example, a pulley belt may need tightening; the gland of a valve may show a slight tendency to leak; the bearings of a pump coupled to an electric motor may become overheated, or the motor itself may show evidence of being overloaded. These irregularities become evident in the course of a regular inspection if that inspection is carried out conscientiously by an experienced maintenance staff.

Pumps, as one essential feature of the majority of chemical plant, provide a typical instance of continuous attention being necessary, because their proper operation is a matter of concern to other parts of the plant which may be dependent upon a continuous feed of liquid or upon the continuous circulation of liquid, *i.e.*, consider the case of a centrifugal pump which provides the flow of scrubbing liquid in an absorption tower. If the pump fails, other parts of the plant may easily have their continuity of operation affected, and the speed of the reaction which is taking place within a vessel may be so altered that its normal course is changed, and as a result the quality of the main product, as well as the yield, will possibly suffer. A properly packed gland giving leakage in the form of a slow drip is known to provide the best operating conditions for a centrifugal pump, and it will also be remembered that such pumps are provided with a special cup to carry this drip to a position of safety. Apart from seeing that the gland is kept at this desirable degree of tightness—not too loose to give true leakage and certainly not too tight to be the cause of too much friction with overheating of the shaft and seizure in the bearings—it is also necessary to see that the slow drip is being properly dealt with and that the channel by which it is conveyed away does not get choked so that an accumulation of liquid causes corrosion at the baseplate of the pump.

Passing from liquids to solids, similar precautions could be cited in the case of a conveyor which is feeding material to a screen or a crusher, for here there are numerous bearings and other features to be kept under observation in order that the rate of delivery is kept constant as far as possible.

Up-keep of Joints

Pipes and valves require a regular amount of maintenance attention. The joints must be kept liquid-tight or vapour-tight; the metal of which the pipes are made must be adequately protected against corrosion from external influences, assuming that the metal has been properly chosen to give good corrosion resistance internally; heat insulation, if provided for, must be kept efficient. The gasket or jointing material of a flanged joint is the most important feature for the maintenance man, because all jointing materials require renewing from time to time, with a varying degree of deterioration according to circumstances, and renewal is frequently occasioned because the joint has to be broken to make an inspection of part of the plant internally. Manhole cover joints have this characteristic, as do also some of the joints where flanges are used to connect a pipe to a reaction vessel. A coating of some suitable corrosion-resisting paint gives preservation externally to pipework. Respecting heat insulation, the need for attention will be obvious when it is remembered that the heat loss from bare pipe rises at an increasing rate with increase of temperature. At a temperature of 200° F. as much as 370 B.Th.U. per square foot of pipe surface can be lost in the absence of a heat insulating material; at 300° F. the loss may become 800 B.Th.U. per square foot, and at 400° F. it may reach 1,400 B.Th.U. Using a one-inch thickness of 85 per cent. magnesia heat insulation (a mixture of magnesia 85 per cent. bonded with asbestos fibre 15 per cent.) these heat losses can be reduced to 50, 90 and 135 B.Th.U. per square foot of surface respectively.

Selection of Suitable Material of Construction

For plant generally, that is, reaction vessels, storage tanks, evaporators, condensers, receivers, etc., the selection of a suitable material of construction is a matter of great importance from the maintenance aspect where corrosion is especially likely to occur and the maximum resistance against it becomes essential. If maintenance costs for any particular processing unit appear to be exceptionally high it should be considered whether or not the substitution of a different type of unit to serve the same purpose can be effectual in bringing down the cost of maintenance to a more acceptable level. For instance, numerous isolated acid storage tanks which are made of wood and provided with an internal lining of lead have been advantageously replaced by one central battery of storage vessels made of acid-proof chemical stoneware. Simultaneously new means for the movement of the acid are adopted in such a replacement, the acid being conveyed to the stoneware storage vessels by pipes which are also made of stoneware, and the distribution of the acid to various parts of the works being made by way of similar pipes, movement taking place under the action of gravity, by pumping, or by the use of air at a low pressure.

Tanks constructed of concrete and provided with an internal lining of acid-resisting tiles set in acid-resisting cement provide an alternative proposal for acid storage; there are also special acid-resisting compositions with which tanks may be constructed or merely lined.

To facilitate the work of the maintenance staff each part of the plant should be easily accessible; attention to this feature during erection will ultimately repay any additional cost which has been involved. Those units which are mechanically operated or have moving parts inside them, such as pumps and pulverising machinery, or a closed vessel fitted with an agitator, must be so placed relative to other parts of the plant that the interior can be attended to with a minimum of trouble. In other words, the manhole on the bolted cover of a closed vessel should be in a position where it can be entered without difficulty, and without the necessity for dismantling other features, although a certain amount of dismantling in the case of belts and pulleys is sometimes unavoidable. Likewise the inspection door of pulverising machinery should be so arranged that the interior mechanism may be inspected frequently without hindrance. Sufficient floor or platform space adjacent to a pump will make it easier for the fitter to dismantle the pump on the spot and then examine the interior. The supporting of vessels and tanks "well up from the floor" will enable the underside to be inspected for leaks and unsuspected corrosion; this is particularly a matter for attention in the case of wooden vats and tanks which are liable to "spring a leak" without warning.

Protective Paints

Iron and steel which is kept properly painted will more favourably resist the attack of corrosive liquids and fumes; structural steelwork especially must be protected. Paints made with a bituminous base, either with or without the addition of pigment, are suitable in many cases, but it should not be overlooked that other types of paint are available, namely, chlorinated rubber and synthetic resin products. Each situation calls for a careful consideration of the factors which may be involved. For instance, in rubber works and paper mills paint must be unaffected by hydrogen sulphide or sulphur dioxide fumes; in the dairy and brewing industries paint must be toxic to fungus growths, because humid conditions exist and are favourable for the rapid growth of fungi; works engaging in fermentation processes need a paint which can be washed down frequently, in order that the course of reaction in the fermentation vats be not changed by stray ferments from some unwashed surface. A somewhat lavish use of aluminium paint, where applicable, will do much to improve conditions for plant which is placed in a badly lit position. Aluminium paints suitable for surfaces which are periodically or continuously at high temperature are obtainable, and these paints may be used advantageously upon furnace doors, steam jacketed kettles, etc.

At every chemical works one of the outstanding calls for maintenance comes from the plant accessories; apart from valves and safety devices there are the glands of agitator shafts, steam traps, measuring and recording instruments, and belts and pulleys. Unless steam traps are properly looked after they may be the cause of a considerable loss of efficiency. Safety valves must be examined at regular intervals to see that they blow off at the proper pressure and that there is no tendency to stick. Electrical equipment calls for a good deal of inspection, but, in the case of motors, not necessarily attention, because the modern electric motor is obtainable in patterns which have been specially designed to meet the exacting conditions of the chemical works with its fume-laden atmosphere and water and steam much in evidence. Simple precautions which are advised by the makers of the equipment should be followed; for instance, the oil in the bearing sumps of a motor should be changed two or three times a year. Insulation tests on the electrical wiring of a plant should be made at least twice a year, being more frequent where high voltages are in use.

Simultaneous with the work of the maintenance staff a proper record of inspection and repairs should be kept. Only by doing so can maintenance be carried out efficiently and economically. A study of these maintenance records will have much to reveal to the owner of the plant and to the actual persons who are operating the plant. From records which have accumulated in the course of a year it may become evident that certain modifications can be effected in the maintenance routine, or that a more frequent inspection in one direction will give better insurance against the possibility of failure with regard to some particular plant unit or accessory. These records are also of importance to the chemical engineer generally, because they make it possible to draw comparisons between different pieces of plant working under similar conditions. From the viewpoint of the works accountant they will provide the requisite information for a correct assessment of depreciation.

Maintenance is by no means a simple matter. To be done efficiently it must be carried out by a full-time staff—even if that "staff" consists of one man only—because having worked out a definite routine that routine should be followed without hindrance from other duties. Moreover, a proper maintenance staff will become highly experienced in those small features which indicate that a particular part of the plant is not running at its highest degree of efficiency. All chemical plant which has an efficient maintenance staff also has an increased degree of safety when in operation.

Dyestuffs Industry

A New Industrial Development Committee

THE Board of Trade have appointed the following committee for a period of three years, to act with the members of the Dyestuffs Advisory Licensing Committee in advising upon the efficient and economical development of the dyemaking industry:—Major J. A. Barber-Lomax, Mr. G. Garnett, Professor A. G. Green, F.R.S., Mr. A. Hittinger, Mr. A. S. Hoskin, Mr. J. R. Lane, Professor Sir G. T. Morgan, F.R.S., Mr. C. S. Robinson, and Mr. G. S. Whitham, M.I.Chem.E.

The members of the Dyestuffs Advisory Licensing Committee are:—Sir Robert Waddington (chairman), Mr. P. Caldwell, Major L. B. Holliday, Professor J. Kenner, F.R.S., Mr. S. T. Kinsman, Mr. D. R. Mackay, Mr. N. G. McCulloch, Sir Miles E. Mitchell, Sir Henry Sutcliffe Smith, Mr. C. M. Whittaker, and Mr. W. J. U. Woolcock.

Mr. F. W. Hammond has been appointed Secretary to the Committee.

Toilet Preparations in Canada

Britain Provides 30 per cent. of Imports

IN 1936 there were 87 Canadian factories engaged in the manufacture of toilet creams, hair tonics, face powders, tooth paste, perfumes, etc. The industry is capitalised at $5,624,306, and employees in 1936 numbered 1,170. The total output value was $6,544,377, including $5,266,994 for toilet preparations and $1,277383 for other products. There is a considerable production of toilet preparations as a minor part of the output of other chemical groups including producers of soap, patent medicines and pharmaceuticals, but about 70 per cent. of Canada's toilet essentials is produced in the factories classified in the "toilet preparations industry."

Imports of toilet preparations into Canada were valued at $430,730 in 1936, compared with $420,819 in 1935. Approximately 51 per cent. of the imports came from the United States, 30 per cent. from the United Kingdom, 16 per cent. from France, and nearly 3 per cent. from other countries.

A PLANT for utilising organic matter in sewage is being built by the city of Budapest. By a biological process methane will be obtained and utilised as a motor fuel.

Tanks, Pipes, Pumps and Valves : Some Aspects of Maintenance

By
A. G. WRIGHT

TANKS, pipes and valves, and also pumps for effecting the movement of chemical liquids, are important plant features at all chemical works and a regular inspection of them is a matter which cannot be neglected. Unless these necessary parts of the plant are properly protected against corrosion, joints are kept leak-proof, and pumps and valves in proper operating condition, the general sequence of plant operations cannot run smoothly and the output of the plant, in consequence, can become erratic.

Tanks are now constructed of a wide variety of materials, and the selection of the material can do much to eliminate corrosion troubles, or at least reduce them to a minimum, so that maintenance costs become correspondingly small. For instance, both tanks and pipes are now obtainable in moulded phenolic resin and asbestos compositions which give especially good resistance against certain corrosive agents such as sulphuric acid and moist chlorine; large tanks made of this material are used in the metal industry for pickling sheets, tubes and wire, and being provided in the form of a one-piece seamless construction, with adequate strength for use under normal working conditions, the risk of leakage is avoided. Nevertheless, although the tanks themselves may require a minimum of attention throughout the year—mainly that of painting with anti-corrosive paint or the maintenance of an efficient layer of heat insulating material—all tanks with bolted-on covers, special charging holes and manholes, necessarily demand periodical inspection and occasional attention to the jointing materials which have been used.

Speaking of pipes, an all-welded assembly of pipework will require a minimum of attention, in comparison with pipework which includes a large number of screwed or flanged joints. Valves, however, by reason of a packed gland, require regular attention (or rather inspection) when continuously in operation, to avoid leakage sooner or later. Even where a particular valve may be operated only at remote intervals, or merely incorporated in the plant to meet an unforeseen emergency, it is equally necessary for inspection and maintenance to follow its normal course in order that the gland may be in perfect condition to permit the proper functioning of the valve when occasion arises.

Prevention of Tank Corrosion

The prevention of corrosion is the principal matter which calls for attention with regard to tanks, for although the material of construction may have been selected so that an intended charge of liquid will have no ill-effect, corrosion on the exterior surface, at flanges, nuts and bolts, may still be caused by such external influences as corrosive vapours from an adjacent plant and a generally damp or steam-laden atmosphere; this applies especially in the case of steel equipment which is situated in the open-air or under a roofed structure open to the weather on one or more sides. To avoid rusting under these conditions the exterior of the tank is kept coated with an anti-corrosive paint of known reliability, preference being shown (in some cases) for a paint with a bituminous base. Tanks which are not subject to corrosion other than that caused by general atmospheric conditions will find that aluminium paint gives good protection. Structural steelwork, which forms the framework of the plant, is also subject to corrosion.

Tanks which are made of one material and lined with another to give better resistance against the attack of liquids which are being handled, generally require more careful inspection from a maintenance point of view than do tanks and vessels which are made wholly of one material, because the double wall increases the risk of faults arising. The shell of the tank in such a " double wall " construction will be made of one material which provides good mechanical strength, but which is unable to withstand the action of the chemicals which are handled; good service or " strength " from the chemical aspect is provided by the internal lining, which may not be as strong as the shell from a mechanical aspect. If, therefore, a fault ultimately develops in the lining, acid or alkali may gain access to the interior surface of the shell with different degrees of ease and there cause corrosion troubles, which may not be noticed until conditions have reached a bad stage or have so far advanced that they have become visible on the exterior surface of the shell, most probably at a riveted seam or a flange.

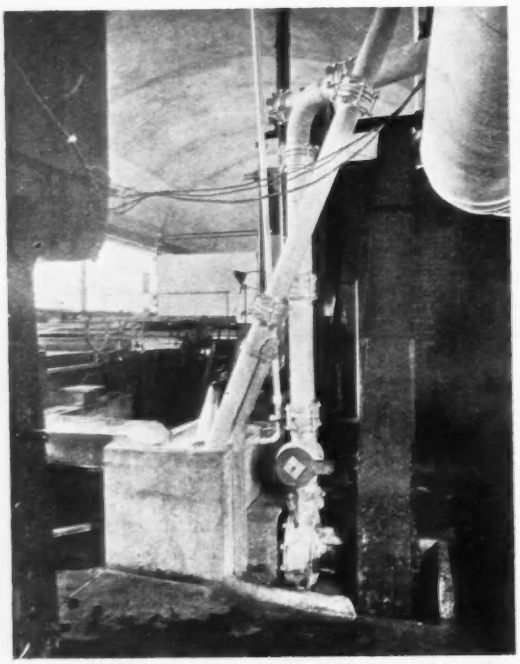
Advantages of Homogeneous Lead Lining

Consider the case of a lead-lined vessel in which a loose lining of lead is provided within a shell made of mild steel or cast iron. Here, continuous heating and cooling will sooner or later cause the internal lead lining to sag or develop blisters, and if the vessel is a closed one for working under a vacuum the troubles will be increased and ultimately acid may get between the lead lining and the steel shell and there exert its corrosive action unnoticed. Such a state of affairs can be entirely obviated by adopting a steel tank which is provided with a " homogeneous lead lining," in place of the loose lining of sheet lead—in other words, a lead lining which is perfectly and rigidly keyed to the steel over the entire surface where the two metals are in contact, so that there is no intervening space or film of air and sagging and blistering cannot take place. In the same way a lining of acid-proof tiles inside a large tank made of concrete, or built in sections from steel channels and plates, can give corrosion troubles which pass unnoticed for some time when a fault develops in the joints of acid-proof cement which are exposed between individual tiles. It therefore becomes necessary to examine these joints periodically, especially at the level reached by the liquid when the vessel is in use.

Corrosion, so far as a metal tank is concerned is likely to occur much more rapidly on the internal surface at the level of the liquid and at the angles and sharp edges—internal or external—rather than elsewhere; it is in such positions that the most careful attention should be directed during inspection. Rivets and staybolts may give rise to corrosion troubles from galvanic action, especially if they become loose and there is a slight accumulation of oxide. Welds may cause failure from galvanic action with unsatisfactory welding, and in the case of welded vessels it is the actual welds and the metal adjacent to the welds which should be examined. Here, possible corrosion may be reduced by having a minimum number of joints and a rigid specification for the welding.

Maintenance of Pipework

Pipework is an indispensable part of nearly all processing plant, and in some cases it can be a costly item, the initial cost of supplying and installing the pipes being as much as five to ten per cent. of the total cost of the plant. If the layout has been properly designed the system should be relatively free from trouble throughout the life of the plant, provided that unforeseen circumstances do not arise and make it necessary for one or more particular sections to be continuously replaced as a result of corrosion or stress troubles. Maintenance will then be mainly a matter of keeping the pipes painted, of preserving the efficiency of heat insulating material where used, and of preserving the liquid or gas tightness of the joints, especially flanged joints. General jointing troubles in an assembly of pipes may be reduced to a minimum by



An illustration of the use of chemical stoneware pipelines, made by Doulton and Co., Ltd., in an important English works. The application of these pipes eliminated corrosion and contamination, and thus avoided costly periodical replacements of parts of the pipe-line.

adopting a welding policy wherever practicable; indeed, in a complicated assembly the use of welding will greatly simplify matters by reducing the number of flanges to an essential minimum.

General maintenance and repairs in other directions will depend more or less upon the arrangement of the pipework from the aspect of being ideal, *i.e.*, absence of pockets and gradients which may give rise to an uneven flow of liquid or cause the condensation of vapour (especially in the case of steam) with subsequent vibration or water hammer. Pipework which is used to convey liquids or vapours at elevated temperature must be properly designed to overcome expansion troubles; this is notably so in the case of a main pipeline, where sufficient flexibility may be needed to avoid the use of special expansion joints. As expansion joints can be a continuous source of weakness and their maintenance may be costly, they should be fitted only in those cases where expansion cannot be taken up in an efficient manner by the provision of expansion bends. In the case of flanged joints the use of bolts and studs made of a selected steel will reduce the risk of failure where joints are at high temperature and subjected to a high degree of stress.

Steel and Iron Pipes

Steel pipes are more immune from the danger of fracture than are pipes made of other metals or non-metallic materials; in addition, steel pipes are obtainable in longer lengths and therefore reduce the number of joints which are required. Being lighter than iron pipes of the same bursting strength, they are easier to support by means of brackets, an adequate number of brackets being essential for all pipework in order to reduce the ill-effect of stresses and a possible weakening of joints by the sagging of the pipes.

On steam pipes defective joints and fittings are not only an increased cost upon the works from the point of view of maintenance, but they are also the cause of increased processing costs due to a resulting waste of steam. Defective heat insulation is likewise a cause of increased processing costs. Speaking of heat insulation another point of some importance arises, namely, that a welded assembly of pipework is much less costly to cover with heat insulation than is an assembly where there are a large number of flanged joints, because the insulation can be applied in longer individual lengths and the inconvenience of the flanges is avoided.

Lead pipe can give rise to a serious repair cost by its low strength and its noticeable tendency to creep, but as lead is more or less an essential material of construction for plant where sulphuric acid is made or used in quantity, the use of lead may be unavoidable, and in bad cases of corrosion the only alternative is to adopt the use of steel pipe which has been provided with a homogeneous lining or coating of chemical lead according to whether its anti-corrosion features are desired internally or externally. For very severe conditions of corrosion pipes made of chemical stoneware will probably give the most satisfactory service, but the strength of this material against breakage by impact is lower than iron or steel and calls for extra precautions.

All plant pipework should be properly marked or identified as to the nature of the liquids or vapours which are passing through it. A maze of pipework which is not properly identified by distinguishing colours can be rather confusing on each occasion of inspection by the maintenance fitter, if only for the reason that the joints upon some of the pipes which carry a particular liquid or vapour may need more constant inspection than other pipes. In addition to colour it is also a good practice to stencil the letters and numerals of an identifying code upon the pipes, so that it is easy to keep a record of the maintenance attention which the pipes have received.

Provision for Expansion

Pipes which are operating at extremely high temperatures are preferably carried by spring hangers, which provide a flexible support that yields to changes in temperature. Where pipes pass underground their general maintenance is greatly facilitated by using trenches or channels properly made of concrete and provided with a loose-fitting cover which can be removed for inspection when the overlaying soil has been taken up; such channels, of course, must be properly protected against heavy traffic when they pass below a roadway. In the erection of an assembly of pipework it should always be remembered that temperature changes can easily set up dangerous stresses and in severe circumstances the equipment served by the pipes, as well as the pipes themselves, can be seriously damaged. Means for taking up expansion must therefore be provided. In other words, every assembly of pipes must have a certain degree of flexibility; at low pressures this is best provided by an offset constructed of short lengths of the same type of pipe and screwed fittings.

The breakdown of a pump can hinder production to a serious extent by making it necessary to shut down the entire plant while repairs are being effected or while a spare pump is being connected up and put into operation. Nevertheless, although this is recognised it is often found that pumps receive only a proportion of the maintenance attention which is really due to them by comparison with other parts of the plant. Except in cases where a full-time maintenance staff is employed, this neglect of the pump is sometimes the result of a pump being placed in a rather inaccessible or badly lit position where frequent inspection may be difficult or uninviting when the pump appears to be running satisfactorily, or where the presence of the pump may be more or less overlooked in the absence of a definite maintenance routine.

Need for Regular Pump Inspection

To reduce the cost of pump repairs to a minimum it is necessary to make an inspection at regular intervals so that undue wear, corrosion, or other possible causes of failure may be detected before the breakdown actually occurs. If inspection is sufficiently frequent there will be little risk of failure taking place at some moment when it is, indeed, most likely to occur, *i.e.*, when the plant is working at full capacity, or equally serious, during a night shift when temporary means of repair may have to be carried out. Pump inspection may be " visual " (at frequent intervals and, sometimes, daily) and " shut-down " (at less frequent intervals in accordance with a

definite programme). In the so-called visual inspection the pump is examined while it is running, adjustment of the glands, temperature of bearings, lubrication, temperature of motor and similar items being checked. For the shut-down inspection the pump is dismantled, sometimes *in situ*, sometimes in an adjacent workshop, to such an extent that the internal parts can be carefully examined for any undue wear on the shaft, shaft sleeves, impeller, etc., to be noted. Glands and bearings need constant attention; the shaft and impeller sealing rings have to be inspected less frequently.

Quite apart from normal wear and tear and the unforeseen circumstances which make a maintenance routine necessary, a certain amount of commonsense in the operation of a pump will do much towards reducing the bill for repairs. For instance, a pump should never be left running with the discharge valve closed, because the gland packing will suffer. The starting of a pump, when crystallisation of the solution inside the pump casing is suspected, will cause damage to the impeller and invariably make it necessary to fit a new impeller. Improper procedure in tightening the gland can easily ruin the gland sleeve, the careless use of a hose pipe when washing down the surrounding floor or an adjacent tank may be the cause of water reaching the bearings, and there are many other examples of thoughtlessness which could be mentioned.

Gland Packing of a Centrifugal Pump

The gland of a centrifrugal pump takes the greatest share of maintenance cost. Re-packing and adjustment at regular intervals must not be shirked if the pump is to be kept in a perfect working condition; indeed, the high maintenance cost of the gland definitely reduces the bill for other repairs. The first essential is that the gland be sufficiently tight to prevent leakage of the liquid which is passing through the pump. Secondly, an excessive frictional resistance must be avoided, because of the risk of overloading the electric motor and of excessive wear on the pump shaft or shaft sleeve. In addition, it should be borne in mind that a sufficient degree of seal is necessary to prevent the admission of air, especially when the pump is operating under suction and is not merely moving a column of liquid. These essentials are attained primarily by giving an even distribution to the packing in the gland, using rings of an appropriate packing material which have been accurately cut, for it is only with this extra care that a light and even pressure can be obtained at all points on the surface of the shaft and effective sealing is procured. If the gland nuts are adjusted by the hand, without the use of a spanner, it is usually found that they can be made sufficiently tight for normal pumping practice (especially applied to water); the resulting "slow drip," amounting to about one drop per second, will then provide an effective seal against the admission of air and also acts as a lubricant to prevent excessive friction with overheating troubles. Slightly more pressure exerted under a quarter or a half turn of the spanner should give satisfactory conditions for chemical liquids which may be somewhat hazardous, or at elevated temperature.

Type of Operating Trouble Encountered

Operating troubles, such as loss of suction, can be traced to the admission of air through a badly packed gland, very often a gland in which the packing has been "stuffed" (not properly "packed") and then unevenly tightened. Loss of suction may also be due to the packing having perished, *i.e.*, having dried out and become so hard that it is quite incapable of preventing the admission of air and needs an excessive application of the spanner to produce sufficient consolidation to prevent the leakage of liquid. The too frequent re-packing of the pump glands can be avoided by taking care to prevent over-heating, which is the main cause of the deterioration of the packing by "drying out." It is this overheating symptom of the need of attention, followed by an excessive tightening of the gland nuts, which leads ultimately to damage in the form of deep grooves upon the shaft and shaft sleeves, thereby giving rise to a more serious and continuous leakage which cannot be remedied without providing a new shaft.

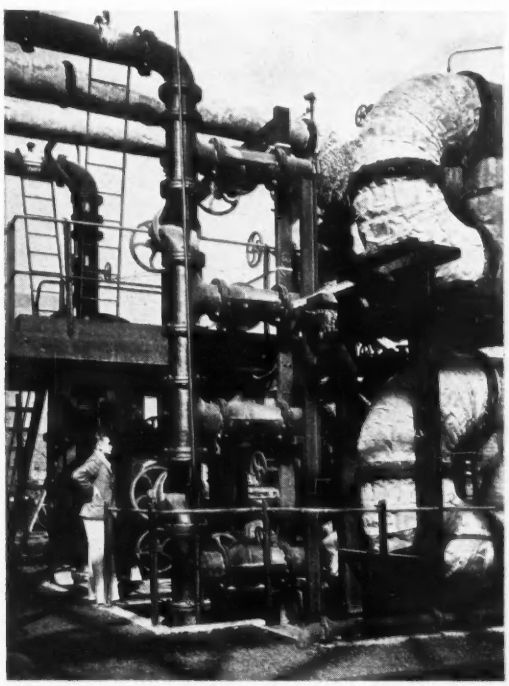
The impeller sealing rings, which have already been mentioned, need be inspected only after long intervals of operation, unless the pump is handling liquids in which there is a suspension of gritty matter. Bearings, irrespective of whether they are ring-lubricated or of the radial ball type, need regular inspection, because even ball bearings have a limited useful working life which varies inversely as the load and diminishes rapidly as the overload rises. The faulty fitting of a ball bearing will usually lead to early failure, especially for bearings of the type which carry axial thrust and ordinary loads simultaneously.

Connecting a Spare Pump

Where the pump is driven direct from an electric motor it is preferable to fix a flexible coupling, as little difficulty is then experienced in substituting a spare pump whenever a shut-down inspection becomes necessary and the continuous operation of the plant must not be unduly interrupted. The ease of changing over to a spare pump also becomes particularly important in the event of a breakdown, for whereas the change over for inspection can usually be done to suit the convenience of the plant generally, a breakdown may be sudden and quite unforeseen. It is also an advantage to use a short sleeve of reinforced rubber suction hose to connect the pump with the pipe-line. This will avoid undue strain caused by the sagging of a support or the settling of foundations, and it is particularly useful in the case of small pumps which are made of high-silicon iron or some other material which is unsuitable for strains imparted by connecting pipes and which have a tendency to throw the bearings and gland of the pump out of alignment. Moreover, if flanged joints are used at the ends of the hose, repairs will be greatly facilitated.

During a visual inspection it should always be noticed whether the drip cups beneath the glands are adequate; if a crystallising solution be passing through the pump, gland leakage which is not properly drained away may set up corrosion at the base of the pump, which will ultimately weaken.

Maintenance, applied to valves, depends much upon the manufacture of the valves, and so far as the user is concerned mainly upon selecting the right valve for a particular job. Variations in valve construction are very numerous and the problem of selection can be complicated. In the case of gate



Valves, made by the Saunders Valve Co., Ltd., installed in a chemical works. The only parts of the valve exposed to the fluid are the body and diaphragm.

valves many variations of the fundamental design have been introduced with the object of making the valves more adaptable to certain specific purposes or to facilitate their maintenance. Gate valves operate by moving a barrier or so-called gate across the path of flow of the liquid, and this gate is guided by a slot in the body of the valve on either side of which is a removable and replaceable ring-shaped seat. In one pattern the gate, in the form of a solid wedge, is forced down into intimate contact with the seat in order to give a tight seal, either a wheel and screw or a lever being used to raise and lower the gate. In another pattern the gate is made of two discs which are lowerd into the opening and then forced apart to come in contact with the seat. Such valves are provided with glands through which the valve spindle or stem is turned. One modification, known as the " non-rising stem " pattern, uses a stem which turns but does not slide in the gland, and here the absence of any lengthwise movement of the stem in the gland can be an important consideration which avoids troubles when the valve is surrounded by a highly corrosive atmosphere.

In those cases where a liquid has solid matter or crystals in suspension, a gate valve will not operate satisfactorily unless the stem is in a horizontal position, because if the stem is in a vertical position either the bonnet of the valve will fill with sediment and thereby prevent operation (assuming that the stem projects down from an overhead pipe-line), or alternatively the groove at the bottom of the body of the valve will have a tendency to fill and thereby prevent a tight closure (if the stem is in a normal vertical position above the pipeline). Troubles such as these, however, are now overcome in unavoidable circumstances by drilling the valve body and connecting a quarter-inch air or water line, so that any accumulated sediment can be removed by blowing it out with air or by flushing it out with water or other suitable liquid.

A plug-cock has special advantages from a maintenance point of view in that it very ably resists corrosion, for the simple reason that the interior machined surface of the body of the valve into which the plug fits does not come in contact with liquid, and only part of the companion surface of the plug is in contact with liquid—when the valve is closed. A lubricated pattern is now available in which the plug can be held tightly in place and still be movable after a long period of disuse, without difficulty, by forcing the lubricant under pressure through special grease passages. Globe valves operate by plugging a hole in the valve body and they vary considerably in constructional details.

Maintenance, for valves, depends largely upon the type of valve which is installed, the frequency with which it is operated, the type of service for which it is used, and nature of liquid which is in contact with the interior of the valve body, seatings, discs or diaphragm, etc. In common for all types of valves the maintenance of the gland is of primary importance, and in this article the remarks which are given for pump glands apply equally well to valve glands, except that additional tightening is necessary because no leakage or drip can be tolerated. An important consideration in the design, which mainly concerns the maker of the valve, is the desired need of the user to be able to re-pack the gland under pressure; many valves are now so designed. Another consideration which applies particularly to the globe valve is that the disc or diaphragm should be of a type which can be quickly and easily replaced, or alternatively the disc and its seating should be capable of being re-ground when necessary. It will therefore be evident that there is also a kind of " shut-down " inspection which applies to valves as well as pumps, in that it is occasionally necessary to examine the interior to see if the disc or diaphragm, or the gates, and their respective seatings, are in perfect condition. A suspicion of failure to close properly is not always evident or even possible from observation of the flow of liquid in the connected pipework.

Machine Labelling

Advantages over Manual Methods

LABELLING is a problem to many manufacturing chemists, due to the variety of products packed in containers of different shapes and of different capacities. Standarisation of containers is limited, as certain products are packed in containers of established form or shape, and it would not be advisable to alter the recognised shape of such containers; labels, however, can be standardised to a certain extent.

A labeller by Anker Bros. and Co., Ltd., on conveyor belt operating in conjunction with filling and packing.

Labelling machines are available for labelling articles such as ½ c.c. ampoules, small phials, tubes, bottles and cartons. Larger machines can deal with medium and large size containers, such as flat, oval and round bottles, jars, cans and boxes. Batch number or control mark can be printed on the back of label by an automatic device on the machine.

The advantages to be gained by machine labelling are manifold and not entirely restricted to the actual labelling. The main advantage, compared with manual labelling—no matter if brush, paste board or gumming apparatus is used as an aid to the hand labelling—is the direct saving in wages. Direct saving in wages alone should pay for the initial cost of a reliable labelling machine within about one year; a machine operating at an average speed of 35 labellings per minute, if fully occupied all the time, will pay for itself in less time.

Using suitable, quick drying adhesives, machine labelled containers can be wrapped or packed immediately without any danger of labels shifting, or of Cellophane or tissue paper adhering to either the container or the label. It is therefore possible to instal a labelling machine to work in conjunction with the filling plant and the subsequent wrapping or packing of labelled containers. The continuous output of a labeller, acting as a pace-maker, indirectly speeds up the various operations in connection with packing.

The accompanying illustration shows an "Anker" labeller operating on a belt, which brings the filled and closed bottles to the labeller, and then transports the labelled containers to the packing table for packing into cartons and transport cases. Considerable saving in table and floor space is obtained.

The accompanying illustration shows an " Anker " labeller operating on a belt, which brings the filled and closed bottles tered. The clean, neat and uniform labelling obtained on a good machine, however, gives the perfect presentation to every packed article, which is a valuable contribution for display, and a good assistance to sales.

Maintenance of Evaporators, Crystallisers and Dryers

By
DR. P. J. BAR

VERY seldom is the maintenance of a new installation investigated and planned in advance, although this is of hardly less importance than first cost, quality of output, and running expenses. Facilities of maintenance, mean possibilities of preserving the value of plant, of keeping it in first class operating condition, and of reducing the running cost by extending the life of the apparatus, and thus reducing depreciation, are of paramount importance. Frequently, between an installation of latest design and an older type, there is a larger difference from the point of view of maintenance than in any other feature. The reason for this is that the manufacturers of chemical plant take an increasing interest in its maintenance and try to relieve the operating staff from many of their duties, so that only an indispensable remainder is left. The equipment is developed in two directions with the aim of, first, eliminating a certain amount of special maintenance work altogether, and second, of making the general maintenance work as easy and comfortable as possible.

General Maintenance

This ordinary maintenance must not, of course, be neglected under any circumstances; otherwise the manufacture and the quality of product would be disturbed by constant irregularities. It is advisable to plan the maintenance of evaporators, dryers, and crystallisers, very carefully. For each individual plant the particular maintenance work which has to be done daily, weekly, or at longer intervals, should be laid down in detail. Inspection of all parts, lubrication, and cleaning, will to a certain extent, be necessary every day. Weekly inspection and cleaning should be more thorough. Every two or three months most installations require stopping and overhauling, and all important parts should be tested. Replacing and adjusting of parts that are subject to particular wear and tear, or unavoidable corrosion, may be necessary at fairly long intervals. All this work should be done regularly in order to maintain normal capacity, even quality of product, and decent appearance of plant.

It is almost impossible to give general rules for the maintenance of chemical plant, because the work required in each particular case varies greatly according to the plant and product. A continuous drying installation for a salt can be worked uninterruptedy for several weeks or even months, whereas a similar plant used for a sensitive organic product may have to be stopped and cleaned every day. A forced circulation evaporator for spent soap lye, can be run for some months, whereas an evaporator for milk has to be boiled out every day, and the tubes brushed every two or three days. A vacuum crystalliser suitable for producing small crystals requires almost no maintenance, whereas a stationary crystalliser should be cleaned after every batch.

Losses of Material

A most important part of evaporators, dryers, and crystallisers is keeping the product where it belongs, namely, inside the equipment, and preventing it from appearing anywhere around the installation. Losses of material, impurities in the product, and danger to moving parts of the plant are unavoidable consequences, quite apart from the damage which corrosive substances are liable to cause by contact with any parts that are not protected against them. Therefore, the smallest leaks should immediately be stopped and cocks, valves, stuffing boxes, joints, and flanges, kept in order with particular care.

For every installation that is not quite simple to maintain, special instructions should be supplied by the manufacturer, so that the operating staff are able to take the best possible care of all parts that need regular attention. With these maintenance instructions, the plant manufacturer should provide for the regular and unavoidable maintenance work. However, the more important and interesting part of the maintenance is that for which the plant manufacturer supplies more than instructions, *i.e.*, the part which he makes easier or unnecessary by suitably designed equipment. In evaporating, drying, and crystallising technique, the maintenance point of view has predominated the development of many improvements. Especially, a great number of evaporators for particular applications have been created with the sole object of improving facilities of maintenance.

Evaporators

A special problem in the case of evaporators, is that of keeping the heating surface clean. This is of vital importance as the heat transmission, and therefore the capacity, depends entirely upon the cleanliness of the heating surface. The oldest and most usual type of evaporator with tubular heating surface, is the vertical type with heating calandria and evaporating space all in one body, where the heating tubes are not particularly accessible, and in no way protected against deposits from the circulating liquid. Originating from this simple internal calandria type of evaporator, many others have been developed, in order to make maintenance easy.

For the concentration of orange, lemon, tomato juice, and other fruit juices which have no tendency to form scales on the heating surface of evaporators, the internal calandria type is still in use. The apparatus is generally made of non-ferrous material and boiled out with water or a soda solution, for a few minutes every day. In the manufacture of condensed milk, a scale of milk stone is formed on the heating surface, and in addition, a slimy deposit of albumen substance. While the latter is removed by daily boiling with a detergent solution, the milk stone must be brushed off with wire brushes every one or two days. This is very disagreeable in the internal calandria evaporator. Therefore, evaporators with external calandria are used where the milk is circulated between a separate heating calandria and an evaporator body. The heating tubes in the external calandria are very easily accessible, especially if the heating system is provided with hinged covers on top and at the bottom.

External Calandria with Forced Circulation

The external calandria evaporator is also used for the evaporation of salt solutions of all kinds. In this case, the plant is frequently worked with forced circulation by means of a pump. The purpose of this arrangement is not so much to increase velocity and heat transmission in the tubes, but the avoidance of scales. Most salt solutions form scales on the heating surface on boiling inside the tubes, and the thickness of these scales increases so rapidly that, after some hours, the heat transmission is very bad and the entire cross-section of the tubes may be blocked. Ordinary evaporators treating such solutions must be boiled out thoroughly at least once per day. The forced circulation evaporator is operated in such a way that the pressure in the heating tubes is kept slightly above the boiling pressure of the solution. In this case, scale is not formed on the heating surface because boiling does not take place. Evaporators of this type can easily be operated continuously.

Of the scales formed in evaporator tubes that of calcium sulphate is the worst. The solubility of calcium sulphate decreases with increasing temperatures, so that deposits on the heating surface are formed when the solution is heated, even if the formation of steam bubbles on the heating surface is carefully avoided. Further, these scales are very hard and insoluble in all liquids with which the tubes might be boiled out; thus the tubes can only be cleaned by drilling them out,

which is very disagreeable and tiresome work. After extensive research, it has been possible to avoid the formation of these calcium sulphate scales by carefully controlling the pressure, velocity, and temperature drop in the calandrias of forced circulation evaporators.

Another method of removing particular types of scale from the heating surface of evaporators consists of breaking them off the outside surface of tubes heated from the inside. Internal heating tubes with the solution to be evaporated circulating outside, are often arranged horizontally. Vertical internally heated tubes are usually closed at the top, and the heating steam is introduced through a small pipe inside the heating tube. In order to remove the scales from the outer tube surface, very cold water is passed through. The scales are thus broken off by the difference in temperature between the heating steam and the cold water. This method of removing scales is naturally less advantageous than the controlled system of forced circulation, by which the formation of scales is avoided altogether.

Vertical internally heated tubes, closed at the upper end, and provided with special steam feeding pipes are also used in external calandria evaporators for very corrosive solutions. In this case the tubes are not expanded into a tube plate, but screwed in, so that it is very easy to replace any tube that has been excessively corroded

In all cases where regular cleaning of evaporator tubes is unavoidable, these tubes should be fairly short, as long tubes are obstacles to efficient cleaning. Evaporators with very long tubes have actually been used for many substances, as it is a particularly cheap design of a heating calandria to provide a comparatively small number of long tubes. Experience with these evaporators has, however, proved that it is advisable to incur the expense of providing the necessary heating surface in the form of shorter tubes.

Crystallisers

Crystallisers can be divided into three groups, stationary, rocking, and vacuum. In the development of the last two types from stationary vessels, the point of view of maintenance has played a certain role, although in this case, continuous evaporation, more uniform product, and increased capacity have been more important aims. There is not very much difference between operation and maintenance of a stationary crystalliser, as there is no proper distinction between discharging and cleaning a layer of crystals from the walls of a vessel. In any case, both are disagreeable and tiresome, and from the point of view of maintenance, as well as probably from every other point of view, continuous crystallisers are more desirable.

Rocking crystallisers and vacuum crystallisers need very little maintenance if they are properly designed so that the crystals do not stick to any part of the plant. This has been a difficulty, especially in vacuum plants where the crystals have a tendency to form immediately at the entrance of the vacuum vessel and to stick to the nozzles through which the liquor is introduced. While such parts may require regular cleaning in some installations, these difficuties have been overcome in the latest designs. In rocking crystallisers, crystals are found on the walls if the plant is not properly operated, or if the vessels are not the right shape.

Valves, cocks, and intermediate pipelines in crystallising plants deserve particular attention. It is advisable to provide heating coils or jackets at all places where undesirable deposits of crystals may develop. Special precautions have to be taken to allow any crystalliser to be stopped without choking the vessels and connection lines with crystals. Rocking crystallisers as well as vacuum crystallisers, designed and started up with the necessary care, need hardly any maintenance except lubrication of the moving parts and cleaning at long intervals.

There are so many different kinds of drying installations that it is impossible to survey them from the point of view of maintenance; the more so, as maintenance has, in this case, hardly been the leading feature in the development of new types. A number of special improvements, however, have been incorporated in various dryers with the object of avoiding or facilitating some particular part of the maintenance. A few of these may be mentioned.

For the satisfactory operation of film dryers perfectly sharp scraping knives are required, otherwise the dried product cannot be completely scraped off the rollers, and the heating surfaces become contaminated. Therefore, an important part of the maintenance of roller dryers was frequent resharpening of the knives. This is now eliminated by the use of special blades, which can be used for several months without being resharpened, so that the maintenance of roller dryers is fairly simple to-day.

In spray drying plants, rotating atomisers require very little maintenance as compared with atomiser nozzles, because the opening of rotating atomisers, which make use of centrifugal force for achieving atomisation, can be as large as desired, while the small openings of nozzles are always liable to be choked after some time of operation. Faults in design will entail a considerable amount of additional cleaning work. Insufficient space in the drying chambers will cause deposits of half-dried material on the walls. Inadequate discharge conveyors will create accumulations of dried material inside the plant at places which may be exposed to high temperatures, or not easily accessible. Devices for the recovery of powder entrained by the exhaust air deserve particular attention from the maintenance point of view. Spray drying installations of careful and experienced design can be run continuously, a minimum of maintenance only being required.

Special Vanes in Rotary Air Dryers

Rotary air dryers formerly required an excessive amount of cleaning and maintenance when applied to materials with a tendency to form sticky lumps in the moist state. Special, interrupted distributing vanes have now been incorporated in these drying drums. The lumps are broken up by these vanes and the material is distributed over the whole cross section of the drums so that frequent cleaning of the plant is no longer necessary, and it is possible to treat these sticky substances continuously without difficulty.

In the case of vacuum drying plants, many recently developed improvements of details are intended to eliminate maintenance, as for instance, heating coils at all places where condensation might occur, vacuum tight rapid closing flaps for powdered substances, mechanised dry dust filters, and evacuating units with steam jet ejectors. Vacuum drying installations should always be worked under the highest possible vacuum. Joints, valves, and cocks should be carefully supervised, and air leakages immediately stopped. High vacuum is not only desirable for the sake of high capacity and quality of product, but also in order to avoid losses and contamination caused by air jets entering the plant.

The general trend in chemical plant design is towards continuous and specialised equipment which requires a minimum of maintenance. Really perfect plants are available for a considerable number of applications. The forced circulation evaporator with controlled velocity, heating, and pressure drop—the continuous crystalliser—certain spray dryers—and continuous vacuum film or agitator dryers, may be cited as outstanding examples of almost ideal types of installations where the maintenance is reduced to supervision and occasional cleaning or replacing of a few parts.

New German Artificial Fibre

GERMAN chemists are investigating the manufacture and possibilities of a new type of artificial fibre similar to wool. The principle underlying the method is that of the transformation of acetylene into a vinylic ether, which is made into fibres and polymerised. The fibres so obtained are useless for clothing purposes, as they soften at a temperature below that of boiling water. It is considered possible, however, that they may find use as filter cloth in various industries. For this purpose it would be particularly good, more especially on account of the tensile strength being 16 to 18 times that of cotton.

Economic Up-keep of Filtration Plant and Filtering Media

By
WILLIAM C. PECK, M.Sc., M.I.Chem.E., A.I.C.

THE filtration operation in a chemical process is often found to be the most expensive of the series of operations, and so for economical management, the filtration plant is always worthy of close attention. There are few chemical engineering processes where there are so many difficulties, and where the solution of these difficulties can only be accomplished purely by trial and error methods.

The costs of a filtering operation that can be given attention are: first, the cost of the labour involved, and, secondly, the cost of the filtering medium (cloth or other material). It is well to point out that the cost of the filtering operation should always be judged on the unit weight of dry filter cake produced, or on the cost per unit volume of solution separated, because it is possible by suitable choice of a filter medium and by proper support of that medium and its treatment, to achieve more economical production, even though the life of the medium be short, by virtue of an increased rate of flow of solution per square foot per hour. The choice of the filter cloth depends on the physical and chemical properties of the suspension to be filtered. A wide range of fibrous materials from coco matting to the finest filter cloths are in use. Wool, linen, jute, cotton, and camel hair are all employed in particular circumstances. When dealing with acidic liquors then the cloth should always be woven from animal fibre. Where the effects of temperature and high acid content are serious then recourse has to be made to porous ceramic materials.

The life of the filter cloths can be lengthened by careful handling and treatment. Every precaution should be taken to remove any strains which shorten the life of the filter medium. Filter cloths should always be washed before putting into use, so that any shrinkage can take place then, for otherwise such shrinkage taking place in the presses themselves causes undue and unnecessary strains. The cloths should also be washed after use and should not be allowed to dry and the precipitate on the surface to cake, for such treatment, unfortunately common in some works, is the cause of subsequent splitting along the caked folds of the cloth. If the precipitate is a fine one, then in order to keep the rate of flow of the liquor as high as possible, the cloths should be washed at every discharge of the press cake, or after every discharge of the precipitate from a box filter. When a larger sized or granular precipitate has to be handled then the washing need only be less frequent. For mildly corrosive liquors metal cloths can be used and are finding extended use where their properties prove suitable.

Porous Ceramic Filtering Plates

Often economies can be made by adoption of porous ceramic filtering plates. These plates have usually a very high mechanical strength, so that the wear that takes place is much less rapid than on other filtering materials. There is usually high resistance to chemical action and clear filtration from the beginning of the operation is obtained. The saving effected by using Schuler plates instead of filter cloths is not solely due to their greater life, but also to the saving in the labour required for replacements. Economies are also obtained by the elimination of risk from the impurities introduced into the filtrate by the decomposition of the filtering medium, and from the risk of damage to the latter.

In use the plates can rest on suitable bearers or be placed directly on the floor of the filter. In the latter case the plates are provided on their lower surface with longitudinal and transverse channels to facilitate the discharge of the filtrate. The joints between the plates can be made with acid resisting jointing. Of course, the porous ceramic material can be used in filter presses constructed of acid resisting materials, and these enable filtrations to be carried out which are impossible with ordinary filter presses provided with cloth. For use in filter presses porous ceramic material of 15 mm. thickness can be obtained having a slight flexibility, which results in long life in the press.

Longer life of the filter cloth and increased rate of flow through the material can be obtained by giving consideration to the support of the cloth. When the cloth is placed against a perforated plate then only that portion of the surface over the perforations is acting at maximum efficiency, and that portion of the cloth against the flat surface is only passing small quantities of filtrate. In gravity or vacuum filters the use of a woven wire mesh, of double crimp weave, is of great assistance in supporting the filter cloth, and so obtaining the maximum free surface for the flow of liquid. Even when the filter cloth is only separated from the flat bottom of a box filter, by the presence of the woven wire, high rates of flow can be obtained.

In such circumstances and where the composition of the liquor permits, woven cane is an excellent substitute. On perforated plates or perforated bottoms of box filters, the use of a coarsely woven material as a supporting medium for the true filter cloth proves very effective and greatly increased rates of flow of filtered liquid are obtained, while the length of life of the filter cloth is considerably increased. The coarsely woven materials most used are camel-hair cloth and coco matting.

Maintenance of the Press Itself

In dealing with the maintenance of the filter presses themselves, it is well to remember that at best they are always liable to become messy and untidy, so that every endeavour should be made to keep them as clean as possible. The joints between the plates should always be cleaned off after each charge, as foreign matter and dirt on the actual joint surface causes leakage. Further, attempts to make the joint good by using increased pressure, only results in causing undue strains on the plates and frames. The grooves in the filter plates should also be kept clean to allow for free drainage. Foreign material in the feed liquor can cause blockage of the inlet ports of the plates. Care should be taken to see that these ports are always kept clear, because tramp material, such as wood and like packing material, can gain entrance to the liquor and be pumped to the plates. Such blocked inlets can cause great strain on the plates, because normally the pressure on both sides of the plate is balanced and equal. When, however, a plate has a blocked inlet then great pressure is exerted on one side only, for on the blocked inlet side there is no balancing pressure. As a result plates are often warped or cracked. A coarse wire strainer fitted to the suction side of the pump will obviate such occurrences. Care should also be taken that in fitting up the press, no folds or creases are present in the filter cloth. The cloth must be perfectly flat, otherwise leaks due to faulty joints are the result.

In building up the press cake, the feed liquor should be introduced at first with as little pressure as possible, so that a freely filtering medium is built up on the face of the cloth. If great pressure is used at the beginning especially with fine precipitates, then the precipitate is forced into the pores of the cloth resulting in clogging with low rates of flow. Filter presses not in use should be kept filled with water, for such precaution prevents rusting of the iron plates and if the plates are made of wood, warping is prevented.

New Technical Books

LUBRICATING GREASES: THEIR MANUFACTURE AND USE. By E. N. Klemgard. pp. 873 New York: Reinhold Publishing Corporation. London: Chapman and Hall, Ltd. 75s.

Grease making has had the attention of investigators for nearly one hundred years, but not until the chemistry of petroleum had made rapid advances and research had been promoted in colloidal chemistry and synthesis, did grease-making processes show any signs of becoming scientifically controlled, rather than trial and error methods. The book under review has been prepared with a view to meeting the needs of grease research chemists and lubrication technologists throughout the world. It is based on an earlier work, "Lubricating Greases," published in 1927, but contains five times as much matter, and has been brought up to date with the inclusion of many new and important advances in manufacture. To those who are unfamiliar with the intense activity in the development of lubricating greases since 1927, it may come as a surprise that a volume of nearly 900 pages could be written. A perusal of the chapter summaries in the table of contents, however, indicates that many technologists who are concerned with lubricating greases from the different aspects of manufacture, application, testing and development of new greases, will appreciate the efforts which have been made in compiling this new "complete reference book." Entire chapters on the chemical and physical characteristics, specifications of grease making materials, and the design and management of grease plants have been included. In addition, the author presents fundamental theories underlying the manufacture of greases and the dispersion of soaps in oil so far as possible, together with many factors not previously discussed in the available literature. In response to the need for information concerning costs, many cost calculations, methods of computing material and compounding costs, and discussions of grease plant economies, have also been included. Analytical methods and tests are given as an appendix of 64 pages. The manufacture of greases is by no means an industry of small dimensions; taking figures for the United States, a conservative estimate places the average total yearly production of all forms of lubricating greases at 110,000 tons.

The present book will therefore be welcomed by a much wider circle of readers than its title might anticipate. Indeed, to take one chapter apart, namely, that dealing with grease manufacturing equipment and plant, even many experienced general chemical engineers will have much to learn.

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DICTIONARY OF ORGANIC COMPOUNDS: The Constitution and Physical and Chemical Properties of the Principal Carbon Compounds and their Derivatives, together with the relevant Literature References. Vol. III. Naphthacarbazole—Zygadenine. Edited by I. M. Heilbron and H. M. Bunbury; assisted by W. E. Jones. pp. 943. London: Eyre and Spottiswoode. £6 6s.

The first two volumes of this dictionary were published in 1934 and 1936. The present volume completes the work, which now provides about 2,500 pages of information upon the constitution and physical and chemical properties of organic compounds and their derivatives. The task of the editors and their assisting authors and readers (eighteen in number) has certainly been a difficult one, if only from the question of just how much matter was to be given for a very large number of the compounds to which reference is made. Even though certain omissions were necessary according to plan, and that the extensive use of abbreviations allowed some of the matter to be condensed to small dimensions, it was still found that the third volume demanded about 100 pages additional to the number anticipated. The second volume, likewise, included an additional 150 pages. The complete work, as now available at a total cost of £18 18s. for the three volumes, gives an alphabetical classification of many thousands of pure organic compounds, and, where necessary to avoid any misinterpretation of the nature of the compound, great stress has been laid on the presentation of the full structural formulæ. After giving chemical and physical properties, comparable information is presented in respect of a selection of derivatives. References to the literature for each compound have been reduced to the minimum so far as possible without loss of any essential data, and here the task of the editors must have been an exceedingly difficult one, and the criticism of workers with specialised experience regarding particular groups of compounds may be invited. Nevertheless, the dictionary, taken as a whole, will certainly prove exceedingly useful to all organic research chemists, irrespective of whether they are working upon industrial problems or matters of purely academic interest. In Volume III references to the literature have been covered up to the end of 1936, and in some cases important papers which have been published during 1937 are also included. The method which is to be adopted in keeping the dictionary up to date is that of issuing revised volumes at regular intervals, the first revision possibly taking place in 1939. While this method will always provide for a complete work in three self-indexing volumes, it might have been more economical for the purchaser to have been supplied with separate supplements of additions and corrections, although it is stated in the preface that the publishers gave careful consideration to this alternative. It is the personal opinion of the present reviewer, however, that the cost of issuing these supplementary volumes would have been lower by comparison with the plan now adopted, and no very great inconvenience would have been experienced in using the dictionary when revised and extended by supplements, although it is agreed that a complete revision in three volumes would ultimately become necessary

New Dyestuffs for Unions

One-Bath Process for Wool and Viscose Staple Fibre Mixture Materials

A NEW range of dyestuffs—the Viscrome range—has been developed by Imperial Chemical Industries, Ltd., to meet the demand of the textile trade for the satisfactory dyeing of spun mixtures of animal and vegetable fibres. The colours give solid shades on wool and viscose staple fibre mixture material, whether loose fibres, yarns or piece, and are applied by a one-bath chrome process.

The problem of the production of dyeings with satisfactory fastness properties on this increasingly popular type of textile material is now claimed to be solved by Viscrome process. The usual process of employing mixtures of neutral dyeing acid dyestuffs and direct dyestuffs, dyed in the presence of Glauber's salts (with probable after-treatment with formaldehyde in an attempt to improve washing fastness) does not give shades with the requisite fastness properties, especially to washing. The Viscrome process, however, gives these properties and simplifies the dyeing operation, rendering matching more simple since it is a one-bath process.

The new process is not a normal union dyeing process since both chrome and direct dyestuffs dye both wool and cotton fibres under the conditions of the Viscrome dye-bath. Viscrome dyeings on wool-viscose staple fibre materials are exceptionally solid and of very good fastness to light, perspiration, washing and sea water, although adjacent white cotton or viscose tends to be stained during washing. They will also satisfactorily withstand an anti-crease process.

NEW companies registered in Bucharest include: Gedeon Richter Co., capital 62 million lei (cosmetic and pharmaceutical products); Pelops Co., capital 9 million lei (heavy chemicals, including hydrochloric acid).

Society of Public Analysts

Election of New Members

THE Society of Public Analysts held a meeting jointly with the Food Group of the Society of Chemical Industry, at the Chemical Society's Rooms, Burlington House, London, on February 2, the President, Dr. G. Roche Lynch in the chair.

The following were elected members of the society: J. E. Byles, W. M. Dowson, A. M. Fill, J. F. Hirst, T. W. Jackson, R. L. Kenny, A. B. Lindsey, F. A. Lyne, C. D. B. Moon, J. W. Tullo, and J. N. Vickers.

Certificates were read in favour of the following candidates for membership:—E. B. Ashcraft (U.S.A.), A. E. Cross, F. R. Ennos, R. L. Lord, M. G. de Navarre (U.S.A.), F. A. Robinson, W. H. Smith, S. R. Thompson, and C. E. Waterhouse.

Fat Absorption and Metabolism

Fat absorption and metabolism was the subject of a paper by Dr. A. C. Frazer, who presented evidence that passage of fats through the walls of the small intestine can take place without hydrolysis to fatty acids and glycerol. In cats such hydrolysis cannot occur, for there is no lipase in the intestines. In human beings lipase is present and part of the fats ingested penetrates the intestinal walls as fatty acids, but a large proportion penetrates unchanged. The fatty acid portion passes to the fat depots by way of the portal vein, liver and hepatic vein, but the unhydrolysed fat avoids the liver and passes to the fat depots by way of the lacteal lymphatics and the systematic vessels. The presence of particles of unhydrolysed fat in the blood was detected microscopically by use of dark ground illumination, and this means was used to study variations in the concentration of the fat particles in the blood in course of digestion.

Concentration of Fruit Juices

Dealing with the concentration of fruit juices by freezing, Mr. P. L. Bilham said that the removal of water by freezing avoids the losses of volatile constituents and the impairment of flavour which result from evaporation, and it also involves much smaller energy changes due to latent heat. Its main disadvantage is the practical difficulty of separating the ice crystals from the juice. In the Krause process, which is operated in two continental factories, this separation is effected centrifugally, and losses have been reduced to an economic figure. Concentration to about 40 per cent. of solids is effected in three stages, and if necessary the content of solids can be further raised sufficiently for storage by addition of sugar.

Chemical Matters in Parliament

Calcium Carbide

IN the House of Commons on February 8, Mr. Kirkwood asked the President of the Board of Trade whether in the event of the Caledonian Power Bill for the production of calcium carbide at Corpach, near Fort William, being approved by Parliament, the Government will consider the advisability of establishing a system of State control whereby the price of carbide will be regulated in such a way as to prevent the British Oxygen Company, or any other semi-monopoly, exacting prohibitive prices from the consumers?

In reply, Mr. Stanley said any calcium carbide made in this country will be in competition with the imported product, which at present enters free of duty. If any application for an import duty comes before the Import Duties Advisory Committee, they must, as part of their statutory functions, consider the interests of the consumer before making any recommendation.

EXPERIMENTAL cultivation of Japanese peppermint plants has produced encouraging results.

Ten Years Back

From "The Chemical Age" of February 11, 1928

The first export shipment of Coalite, the smokeless fuel produced by Low Temperature Carbonisation, Ltd., will leave Hull for Denmark in a few days.

* * * *

West's Gas Improvement Co., of Miles Platting, Manchester, has secured a £130,000 contract for a carbonising plant for the Warsaw gasworks against keen German competition.

* * * *

A Benjamin Franklin memorial, of a utilitarian kind, is to be erected in Philadelphia, at a cost of £2,000,000. Mr. C. H. K. Curtis, head of the Curtis Publishing Co., is chairman of the committee.

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Sales of nitrate of soda reported by the Producers' Association since the introduction of free selling up to January 15 amounted to 2,730,596 metric tons, including 103,201 tons disposed of for delivery in the 1928-29 nitrate year. It is understood that further sales have been effected at prices ranging from 16s. to 17s. 2d. per metric quintal, according to delivery dates.

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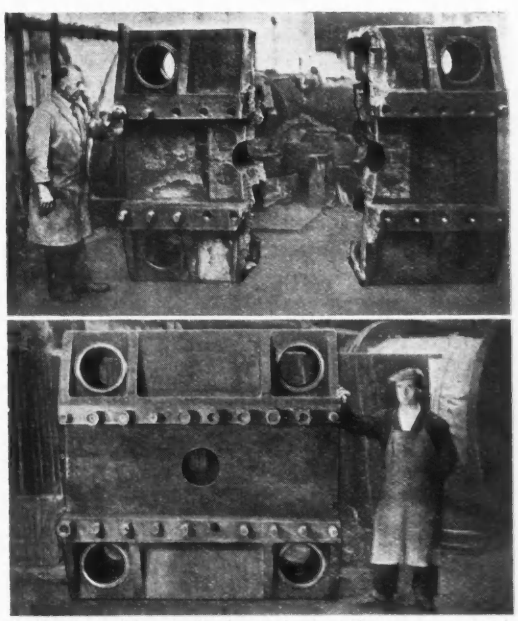
Dr. J. J. Fox, of the Government Laboratory, and Dr. W. Rosenhain, of the National Physical Laboratory, have been elected members of the Royal Institution. Among recent gifts to the Institution are the only surviving part of the original manuscript of Faraday's "Chemical Manipulation," given by Mr. Robert Mond, and the first sugar syrup synthesised from carbon dioxide, given by Professor E. C. C. Baly.

A SALES company for chlorine products has been formed under participation of such leading producers as Etablissements Kuhlmann, Société Bozel-Maletra, Alais Forges et Camargues, Solvay and Cie, and Soc. de Saint-Gobain. The new concern is styled Société Commerciale de Chlore.



This fractured head of a large hydraulic press, weighing nearly 15 tons and measuring 6′ × 6′ × 3′ 6″, was soundly repaired by welding carried out by Barimar, Ltd., on the site. The photograph shows the press head before and after welding. The job is said to be the world's largest welding repair; more than a ton of welding material was used in the work.

Personal Notes

THE LATE MR. WILLIAM CUNNINGHAM, dyer, of Paisley, has left estate valued at £19,817.

MR. H. J. WARD has retired from the board of J. and E. Hall, Ltd., makers of refrigerating plant.

DR. J. M. NAFTALIN, of Ayr, has been appointed lecturer in bio-chemistry at Bradford Technical College.

MR. DAVID SMALL has retired after over 56 years' service with J. Pullar and Sons, Ltd., dyers and cleaners, Perth.

THE LATE MR. JOHN ELDIN COLLETT MOULDEN, a director of Barronia Metals, Ltd., left estate valued £37,904 with net personalty £32,617.

MR. JOHN ISMAY has been appointed chairman of the Tungsten Manufacturing Co., Ltd. He is chairman and managing director of Ismay Industries, Ltd.

MR. MICHAEL SIMON SCOTT, a director of Coal and Allied Industries, Ltd., died when fishing from a boat off Palm Beach, Florida, last week.

MR. GEORGE NOVELLO COPLE has been appointed by the Liverpool Education Committee to the position of lecturer in chemistry at the City Technical College.

MR. CHARLES WALTER MUNDAY, of Plumstead, an assistant chemist at Woolwich Arsenal, is among the four persons now being charged with offences under the Official Secrets Act.

MAJOR N. E. WEBSTER, managing director of the Nunnery Colliery Co., has been appointed a director of Benzol and By-Products, Ltd., in place of Mr. Arthur Roby, who has retired.

MR. WM. SKINNER, who has been connected with Thomson Skinner and Hamilton, Ltd., laboratory furnishers and scientific instrument makers, Glasgow, since 1903, is retiring on May 15.

MR. H. GOSLING, who has given four years' service as secretary to the Manchester Section of the Oil and Colour Chemists' Association, has now taken up an appointment with his firm in London. Mr. R. Fulton is the acting hon. secretary of the section.

MR. MATTHEW ANDERSON has been appointed to the post of director of the Coal Utilisation Council, which was left vacant by the resignation of Mr. W. R. Gordon. Mr. Anderson has had a wide experience of journalism, newspaper management, industrial development, and industrial publicity.

MR. A. P. HADOW, chairman of the Rubber Growers' Association, has been appointed to represent the association as an honorary vice-president of the Rubber Technology Conference being organised by the Institution of the Rubber Industry. This conference will take place in London from May 23 to 25.

PROFESSOR H. S. TAYLOR, professor of physical chemistry in Princeton University, has had the Cross of Commander of the Order of Leopold II conferred on him by the King of the Belgians in recognition of the services rendered by him to Belgium as occupant of the Francqui chair at Louvain in chemistry January to June, 1937.

THE LATE ALBERT EDWARD THOMPSON, senior director and former chairman of John Thompson Engineering Co., Ltd., of Wolverhampton, and a director of the Sankey Sugar Co., Ltd., left estate valued £313,221, with net personalty £307,350, on which estate duty of £109,616 has been paid. In accordance with Mr. Thompson's wishes, the executors are arranging to distribute a sum of approximately £10,000 to the staff and employees of the John Thompson companies in proportion to their service. Over 1,100 employees with a service of five years or more will be affected, but a total of nearly seventeen thousand years of service is covered. It is also proposed to form a fund of £5,000, to be known as the Albert Thompson Fund, the income from which will be used for the benefit of the children of the employees, to provide extra medical benefits, holidays, etc., for those who are convalescent.

OBITUARY

MR. WILLIAM STAFFORD, formerly a tallow manufacturer and candle maker, has died at Longford, near Coventry, at the age of 73.

MR. REES JENKINS, M.B.E., who has held the position of chemical engineer to the Sheffield Gas Co. for the past fifteen years, died recently at the age of 51. Mr. Jenkins received his training both in England and Germany, and prior to his appointment at Sheffield, was in charge of the chemical works of the Coventry Gas Department.

MR. HARVEY S. FIRESTONE, SEN., a pioneer of the American rubber industry, died at his home at Miami Beach, on February 7, at the age of 69. Mr. Firestone, who was born in Ohio and educated at a business college, became, in 1896, president of the Victor Rubber Co. A few years later he organised the Firestone Tyre and Rubber Co. of the United States, and followed this with a similar company in Canada and also the Firestone Steel Products Co. In 1922 he led a campaign in opposition to the scheme put into force by the British Government for restricting the output of rubber as a means of building up the industry. In October, 1928, the Firestone and Rubber Co. began operations in England by opening a large factory at Brentford, near London.

Foreign Chemical Notes

Czechoslovakia

GLUE MANUFACTURE FROM BONES is to be started by the Biochema concern of Brünn, using raw material from the "Morakost" Butchers' Co-operative Society. It is believed that Biochema will remain outside the glue cartel.

Poland

CHLOROFORM IS BEING PRODUCED ON A LARGE SCALE by the Grodzisk Chemische Fabriek A.-G., who also contemplate making hexamethylene tetramine (pharmaceutical quality) in the near future. For some years the concern has been making vinegar essence and wood carbonisation products.

Hungary

THE PRODUCTION OF STEARINE and elain has been started by Edmund Mauthner A.G.

A NEW PARAFFIN WAX FACTORY is being built by the Salgotarjan Anthracite Mining Co.

CONSIDERABLE EXTENSIONS to its manufacturing plant are announced by the Budapest shoe cream concern of Schmoll and Kallos.

THE CHINOIN PHARM.-CHEM. FABRIK A.G. reports a net profit for 1936 of 75,000 pengo as compared with 62,900 in the previous year.

Finland

A PURCHASE OF 5 GRAMS OF RADIUM is to be made by the Association for Fighting Cancerous Diseases, using part of a fund of 5 million Finnish marks. The supplier is reported to be the Société Nouvelle de Radium Gif of France.

THE EXPANSION PROGRAMME OF THE SULPHATE CELLULOSE FACTORIES of the Enso-Gutzeit concern, at Kotka and Kaupoä, is now complete and gives these factories an annual production capacity of 60,000 tons and 110,000 tons respectively. Considerable activity also prevails among other firms in the cellulose industry. The sulphate cellulose works of the Oulu O.Y., of Uleaborg (Oulu), started up last autumn, and plans to increase its output in 1938 to 100,000 tons. The sulphate cellulose factory of the Sunila O.Y., at Kotka, and the sulphite cellulose factory of the Aanekosi A.B., at Aanekosi, will enter the market as producers this year with outputs of 80,000 and 40,000 tons respectively.

From Week to Week

THE COMMISSIONER FOR THE SPECIAL AREAS is expected to take over Palmer's Works site for the new steel works scheme at the end of next month, states a Jarrow message.

MANCHESTER CHEMICAL CLUB is organising an inter-chemical societies billiards match, in which all the chemical societies of Manchester are being invited to take part.

THE REFINERY OF THE STATE OILFIELDS at San Lorenzo, near Rosario, was opened by the Argentine Minister of Agriculture last week. The plant has a capacity of 450,000 cubic metres of crude oil, which yields 176,000 litres of petrol.

THE SUPPLEMENT TO "CIBA REVIEW," for February deals with a new method for printing Cibanone Blue RS Double Paste on cotton and artificial silk. It relates to investigations carried out in the printing laboratories of the Society of Chemical Industry in Basle.

THE BRITISH OXYGEN CO., LTD., demonstrated the use of its oxy-acetylene cutters for releasing people trapped by the fall of steel girders, or for effecting an entrance through steel doors or girders to extinguish fires due to an air raid, at Sutton Coldfield on February 4.

LARGE GASHOLDERS at Birmingham Gasworks, Saltley, were threatened by a fire which, on February 3, destroyed some disused wooden cooling towers at a temporary electricity generating station erected prior to 1928. The paintwork on one of the gasholders was blistered by the heat.

A PRIZE OF TEN GUINEAS offered by the United Steel Companies for the best design for their stand at the British Industries Fair has been awarded to Mr. J. C. Jones, their assistant blast-furnace superintendent at Workington. The competition was open to the whole of the 10,000 employees at Sheffield, Rotherham, Scunthorpe and Workington.

FILLING MACHINES FOR POWDERS, LIQUIDS AND PASTES, handled by the Pascall Engineering Co., were described in THE CHEMICAL AGE, January 29, page 88, but it should have been made clear that the "conventional pump" mentioned in the third paragraph forms part of the machines which are supplied expressly for handling liquids and creams The more elaborate model of the hand-operated collapsible tube closing machine, referred to at the end of the fourth paragraph will close 1,500 tubes per hour (not 500 tubes, as stated).

PRACTICAL RECOMMENDATIONS which should lead to eradicating discolouration and corrosion in canned cream are put forward in a recent publication of the International Tin Research and Development Council. The work was undertaken by C. J. Jackson and G. R. Howat of the Hannah Dairy Research Institute, and T. P. Hoar of the International Tin Research and Development Council.

THE UNION GOVERNMENT OF SOUTH AFRICA has announced its intention of spending £9,000 on an aerial survey of Namaqualand, for the purpose of ascertaining whether the known deposits of beryllium in that territory are worth commercial exploitation. Recently, Mr. Van der Bijl, chairman of the Pretoria State Steelworks, carried out a surface survey of Namaqualand and obtained 90 tons of beryllium, which was sufficient to pay all expenses of the survey.

NINE PERSONS WERE KILLED in an explosion at a dynamite factory belonging to Cape Explosives Works, Ltd., at Somerset West, 30 miles from Capetown, on February 4. The factory, which employs about 250 European and 900 coloured and native workers, manufactures explosives of all kinds for mining subsoiling and other purposes. The company is a subsidiary of African Explosives and Industries, Ltd., which is jointly controlled by Imperial Chemical Industries and De Beers Consolidated Mines.

OWING TO THE INITIATIVE of Mr. Juan Tampier, technical manager of the Compania de Industrias Cimicas, a Chilean concern connected with I.C.I., plant for the treatment of low-grade copper ore by a new process is to be established at Antofagasta. Hydrogen sulphide will be used to treat the ore, and the gas is to be produced by passing sulphur dioxide through burning coke. The new process is claimed to deal with ores having a copper content of as little as 3 per cent. to 5 per cent.

THE BRITISH PLASTICS FEDERATION, LTD., is organising a special trade luncheon, for the members of the plastics industry, at the forthcoming British Industries Fair. This luncheon will be held in the Conference Room in the Gallery of the National Hall, Olympia, on February 24, at 1.15 p.m. A number of important and distinguished guests are being invited, including certain officials of the Department of Overseas Trade and visitors from abroad. In order to ensure the comfort of those present, a limit of 100 is being put on the attendance. February 24 will also be the occasion of a Royal Visit to Olympia. Early application for tickets, 10s. 6d. each, should be made to the Secretary, British Plastics Federation, Ltd., 1-3 St. Paul's Churchyard, London, E.C.4.

LAKE SULPHITE PULP CO., Canada, has been granted a receivership following difficulties in raising finance for the completion of plant for the manufacture of rayon pulp.

THE INSTITUTE OF EXPORT, held their annual general meeting on January 25, when Mr. R. J. Turner, export manager of C. C. Wakefield and Co., Ltd., was elected chairman for the third year in succession.

FIRE BROKE OUT IN THE LABORATORIES of the Monsanto Chemical Works, at Cefn Mawr, on February 4. It is believed that the outbreak was caused through the explosion of a still containing an inflammable liquid.

AN ELECTRIC HIGH FREQUENCY FURNACE exploded at the works of Thomas Firth and John Brown, Ltd., steel manufacturers, Sheffield, on February 6, when a leakage in the cooling system caused water to drop into the interior of the furnace.

THE BRITISH THERMOSTAT CO., LTD., of Sunbury-on-Thames, havt issued brightly-coloured calendar blotters bearing an invitation to visit their stand, No. Cb. 700, at the British Industries Fair, Birmingham.

COPPER PRODUCTION IN CANADA in November, 1937, totalled 50,735,281 lb., as compared with 51,853,071 lb. in October, 1937, and 37,007,475 lb. in November, 1936. Nickel production in Canada in November, 1937, totalled 19,733,115 lb., as compared with 18,491,589 lb., in October, 1937, and 15,087,856 lb. in November, 1936.

AS A RESULT OF THE EXPLOSION at Ardeer Factory, Stevenston last week, when six persons lost their lives, some of the workers employed in the blasting section are now protesting against the conditions of work. Negotiations are proceeding between the workers and the management.

OPERATIONS BY THE CLYDE SOYA BEAN FACTORY, LTD., at Shieldhall, Glasgow, will begin in about ten days' time. Supplies of soya beans are being drawn from Manchuria. About 40,000 tons of soya meal and between 8,000 and 9,000 tons of soya oil will be produced per year. The new factory cost over £120,000.

A JOINT MEETING ON ROAD SAFETY will be held on March 1 at the Institution of Civil Engineers, Great George Street, Westminster, London, S.W.1, by sixteen societies. The meeting is being organised by the Institution of Automobile Engineers, for the presentation and discussion of papers on the subject of "Essential Road Conditions Governing the Safety of Modern Traffic."

TWO UNDERGRADUATES OF MERTON COLLEGE, Oxford, Mr A. G. M. Hedley and Mr. A. E. Brown, are detained in Radcliffe Infirmary, with injuries to the face and legs caused by flying splinters of glass after an explosion in the old chemistry department of Oxford University Museum. They were making a freezing bath of liquid oxygen and pentane when the apparatus exploded.

A NEW CANNING FACTORY for the production of crude oil tins is to be erected at the National Oil Refinery's premises at Llandarcy, near Neath, Glamorganshire. The new factory will provide employment for over 200 men. It is the second canning factory to be established in South Wales during the last eighteen months. The first was built by the Metal Box Co., adjacent to the Eaglebush tinplate works which is owned by the same company.

THE ERECTION AND EQUIPMENT of the physical laboratory at Oxford, provided for in Viscount Nuffield's gift last year of £1,000,000 for a new college, was sanctioned in Congregation at Oxford on February 7. Of this £1,000,000 the sum of £100,000 had been earmarked for the laboratory. In the decree which has been approved it is laid down that the curators of the University chest should expend a sum "not exceeding £99,944" for this purpose.

THE D'ARCY EXPLORATION CO., LTD., a subsidiary of the Anglo-Iranian Oil Co., Ltd., which is carrying out prospecting operations over 9,000 square miles of Great Britain, has completed its fourth exploratory test well at Kingsclere, near Newbury. Drilling started on May 29, 1937, and was completed at a depth of 5,125 feet on January 17 this year. The cost of this hole is in the neighbourhood of £25,000, and it is estimated that the D'Arcy Exploration Co. to date has spent £300,000 on its activities in Great Britain.

A SCHEME OF TRAINING IN AIR RAID PRECAUTIONS is being formulated by the Buxton branch of Imperial Chemical Industries, Ltd. Speaking at the annual dinner of the Tideswell Division of the St. John Ambulance Brigade on February 5, Mr. K. H. Holley, the labour manager at Buxton, said that the branch was going to appoint twenty inspectors so that the whole of the I.C.I. employees at Buxton could receive instructions if they so desired. Many of the instructors would be drawn from among those members of the Tideswell Division of the St. John Ambulance Brigade who had already obtained a certificate for air raid precautions.

Weekly Prices of British Chemical Products

THERE have been no outstanding price changes to record during the past week for general chemicals, rubber chemicals and wood distillation products values throughout the market remaining remarkably steady. The movement of chemical products into consumption has been on a fair average scale although the volume of fresh bookings has been rather less than for the corresponding period a year ago. Rather more interest has been displayed in heavy acids and a fair inquiry is reported for solvents and tanning materials. In the coal tar section lower values are attracting a little more inquiry, but the actual volume of firm buying orders remains on an extremely small scale. Pyridine continues in good demand and quotations for cresylic acid are easier, but in other directions conditions remain much the same as last week. The market on the whole is sensitive in tone.

MANCHESTER.—From the point of view of contract deliveries fairly active conditions have been reported in most sections of the Manchester chemical market during the past week, though it is felt in some quarters that an early contraction of the call for supplies from the textile dyeing and allied industries is not unlikely unless the Lancashire cotton trade shows some improvement. New business in the heavy chemicals has been on moderate lines, with transactions mainly confined to parcels for near delivery positions. Among the tar products buying of most descriptions of materials has been on a restricted scale and in a number of directions the lower trend of prices is still in evidence.

GLASGOW.—Business in chemicals has been much quieter during the week, both for home trade and export. Prices generally continue very steady at about previous figures, but Red Lead and White Lead have been reduced £1 per ton, on account of the fall in the price of the metal.

Price Changes

Rises: Nitric Acid; Sodium Hyposulphite, pea crystals; Copper Sulphate (Manchester); Potassium Prussiate, B.P. (Manchester).

Falls: Cresylic Acid, 97/99%; Pale, 99/100%; Dark, 95%; Pale, 99/100% (Manchester); Carbolic Acid, crystals and crude (Manchester); Creosote (Manchester); Naphthalene, crude, whizzed or hot pressed; purified crystals; Pyridine, 90/160%; Toluol, 90%; Litharge (Scotland); Red Lead (Scotland); Copper Sulphate (Scotland).

General Chemicals

ACETONE.—£45 to £47 per ton.

ACETIC ACID.—Tech, 80%, £30 5s. per ton; pure 80%, £32 5s.; tech., 40%, £15 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. MANCHESTER: 80%, commercial, £30 5s.; tech. glacial, £42 to £46.

ALUM.—Loose lump, £8 7s. 6d. per ton d/d; GLASGOW: Ground, £10 7s. 6d. per ton; lump, £9 17s. 6d.

ALUMINIUM SULPHATE.—£7 2s. 6d. per ton d/d Lancs. GLASGOW: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 1s. to 1s. 1d. per lb. d/d in cylinders. SCOTLAND: 10½d. to 1s. 0½d., containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks.

AMMONIUM CHLORIDE.—Grey galvanising, £19 per ton, ex wharf.

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

AMMONIUM DICHROMATE.—8½d. per lb. d/d U.K.

ANTIMONY OXIDE.—£68 per ton.

ARSENIC.—Continental material £11 per ton c.i.f., U.K. ports; Cornish White, £12 5s. to £12 10s. per ton f.o.r., mines, according to quantity. MANCHESTER: White powdered Cornish, £16 10s. per ton, ex store.

BARIUM CHLORIDE.—£11 10s. to £12 10s. per ton in casks ex store. GLASGOW: £11 10s. per ton.

BLEACHING POWDER.—Spot, 35/37%, £9 15s. per ton in casks, special terms for contracts. SCOTLAND: £9 per ton net ex store.

BORAX COMMERCIAL.—Granulated, £16 per ton; crystal, £17; powdered, £17 10s.; extra finely powdered, £18 10s., packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Granulated, £16, crystal, £17; powdered, £17 10s. per ton in 1-cwt. bags, carriage paid.

BORIC ACID.—Commercial granulated, £28 10s. per ton; crystal, £29 10s.; powdered, £30 10s.; extra finely powdered, £32 10s. in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Crystals, £29 10s.; powdered, £30 10s. 1-cwt. bags in 1-ton lots.

CALCIUM BISULPHITE.—£6 10s. per ton f.o.r. London.

CHARCOAL, LUMP.—£6 to £6 10s. per ton, ex wharf. Granulated, £7 to £9 per ton according to grade and locality.

CHROMETAN.—Crystals, 2½d. per lb.; liquor, £19 10s. per ton d/d. station in drums. GLASGOW: 70/75% solid, £5 15s. per ton net ex store.

CHROMIC ACID.—9½d. per lb., less 2½%; d/d U.K.

CHROMIUM OXIDE.—11d. per lb.; d/d U.K.

CITRIC ACID.—1s. 0½d. per lb. MANCHESTER: 1s. 0½d. SCOTLAND: B.P. crystals, 1s. 0½d. per lb.; less 5%, ex store.

COPPER SULPHATE.—£21 7s. 6d. per ton, less 2% in casks. MANCHESTER: £19 10s. per ton f.o.b. SCOTLAND: £19 5s. per ton, less 5%, Liverpool, in casks.

CREAM OF TARTAR.—100%, 92s. per cwt., less 2½%. GLASGOW: 99%, £4 12s. per cwt. in 5-cwt. casks.

FORMALDEHYDE.—£20-£22 per ton.

FORMIC ACID.—85%, in carboys, ton lots, £42 to £47 per ton.

GLYCERINE.—Chemically pure, double distilled, 1.260 s.g., in tins, £4 17s. 6d. to £5 17s. 6d. per cwt. according to quantity; in drums, £4 10s. 6d. to £5 3s. 6d.

HYDROCHLORIC ACID.—Spot, 5s. 6d. to 8s. carboy d/d according to purity, strength and locality.

IODINE.—Resublimed B.P., 6s. 4d. per lb. in 7 lb. lots.

LACTIC ACID.—(Not less than ton lots) Dark, 50% by volume, £21 10s.; by weight, £27 10s.; Pale, 50% by volume, £27; by weight, £32 per ton. LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50%, by vol., £41. One-ton lots ex works, barrels free.

LEAD ACETATE.—LONDON: White, £31 10s. ton lots; brown, £35. GLASGOW: White crystals, £31 10s.; brown, £1 per ton less. MANCHESTER: White, £33; brown, £32.

LEAD, NITRATE.—£32 per ton for 1-ton lots.

LEAD, RED.—£32 15s. 0d. 10 cwt. to 1 ton, less 2½% carriage paid. SCOTLAND: £31 per ton, less 2½% carriage paid for 2-ton lots.

LITHARGE.—SCOTLAND: Ground, £31 per ton, less 2½%, carriage paid for 2-ton lots.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—SCOTLAND: £7 10s. per ton.

MAGNESIUM SULPHATE.—Commercial, £5 10s. per ton, ex wharf.

MERCURY.—Ammoniated B.P. (white precip.), lump, 5s. 11d per lb.; powder B.P., 6s. 1d.; bichloride B.P. (corros. sub.) 5s. 2d.; powder B.P. 4s. 10d.; chloride B.P. (calomel), 5s. 11d.; red oxide cryst. (red precip.), 7s.; levig. 6s. 6d.; yellow oxide B.P. 6s. 4d.; persulphate white B.P.C., 6s. 1d.; sulphide black (hyd. sulph. cum sulph. 50%), 6s. For quantities under 112 lb., 1d. extra; under 28 lb., 5d. extra.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NITRIC ACID.—Spot, £25 to £30 per ton according to strength, quantity and destination.

OXALIC ACID.—£48 15s. to £57 10s. per ton, according to packages and position. GLASGOW: £2 9s. per cwt. in casks. MANCHESTER: £49 to £54 per ton ex store.

PARAFFIN WAX.—SCOTLAND: 3¾d. per lb.

POTASH CAUSTIC.—Solid, £35 5s. to £36 15s. per ton for 2-ton lots ex store; broken, £42 per ton. MANCHESTER: £39.

POTASSIUM CHLORATE.—£36 7s. 6d. per ton. GLASGOW: 4¼d. per lb. MANCHESTER: £37 10s. per ton.

POTASSIUM DICHROMATE.—5½d. per lb. carriage paid. SCOTLAND: 5¼d. per lb., net, carriage paid.

POTASSIUM IODIDE.—B.P. 5s. 6d per lb. in 7 lb. lots.

POTASSIUM NITRATE.—Small granular crystals, £24 to £27 per ton ex store, according to quantity. GLASGOW: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9¾d. per lb. SCOTLAND: B.P. Crystals, 9¾d. MANCHESTER: B.P. 11d. to 1s.

POTASSIUM PRUSSIATE.—6½d. per lb. SCOTLAND: 7d. net, in casks, ex store. MANCHESTER: Yellow, 6½d.

SALAMMONIAC.—Firsts lump, spot, £42 17s. 6d. per ton, d/d address in barrels. Dog-tooth crystals, £36 per ton; fine white crystals, £18 per ton, in casks, ex store. GLASGOW: Large crystals, in casks, £37 10s.

SALT CAKE.—Unground, spot, £3 10s. 6d. per ton.

SODA ASH.—58% spot, £5 17s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, £14 per ton d/d station. SCOTLAND: Powdered 98/99%, £18 10s. in drums, £19 5s. in casks, Solid 76/77° £15 12s. 6d. in drums; 70/73%, £15 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts, 10s. per ton less.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£19-£20 per ton carriage paid North. GLASGOW: £18 10s. per ton net ex store.

SODIUM BICARBONATE.—Refined spot, £10 15s. per ton d/d station in bags. GLASGOW: £13 5s. per ton in 1 cwt. kegs, £11 5s. per ton in 2-cwt. bags. MANCHESTER: £10 10s.

SODIUM BISULPHITE POWDER.—60/62%, £20 per ton d/d 1 cwt. iron drums for home trade.

SODIUM CARBONATE MONOHYDRATE.—£20 per ton d/d in minimum ton lots in 2 cwt. free bags.

SODIUM CHLORATE.—£27 10s. to £32 per ton. GLASGOW: £1 11s. per cwt., minimum 3 cwt. lots.

SODIUM DICHROMATE.—Crystals cake and powder 4½d. per lb. net d/d U.K. with rebates for contracts. MANCHESTER: 4d. per lb. d/d U.K.

SODIUM CHROMATE.—4¼d. per lb. d/d U.K. GLASGOW: 4½d. net, carriage paid.

SODIUM HYPOSULPHITE.—Pea crystals, £15 5s. per ton for 2-ton lots; commercial, £11 5s. per ton. MANCHESTER: Commercial, £11; photographic, £15 10s.

SODIUM METASILICATE.—£14 5s. per ton, d/d U.K. in cwt. bags.

SODIUM NITRATE.—Refined, £8 per ton for 6-ton lots d/d. GLASGOW: £1 12s. 0d. per cwt. in 1-cwt kegs, net, ex store.

SODIUM NITRITE.—£18 5s. per ton for ton lots.

SODIUM PERBORATE.—10%, 9½d. per lb. d/d in 1-cwt. drums.

SODIUM PHOSPHATE.—Di-sodium, £12 per ton delivered for ton lots. Tri-sodium, £15 to £16 per ton delivered per ton lots.

SODIUM PRUSSIATE.—½d. per lb. for ton lots. GLASGOW: 5d. to 5¾d. ex store. MANCHESTER: 4¼d. to 5d.

SODIUM SILICATE.—£9 10s. per ton.

SODIUM SULPHATE (GLAUBER SALTS).—£3 per ton d/d.

SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 to £3 10s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 12s. 6d.

SODIUM SULPHIDE.—Solid 60/62%, Spot, £11 15s. per ton d/d in drums; crystals, 30/32%, £9 per ton d/d in casks. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 10s.

SODIUM SULPHITE.—Pea crystals, spot, £14 10s. per ton d/d station in kegs.

SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.

SULPHURIC ACID.—168° Tw., £4 11s. to £5 1s. per ton; 140° Tw., arsenic-free, £3 to £3 10s.; 140° Tw., arsenious, £2 10s.

TARTARIC ACID.—1s. 1¼d. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 1s. 1½d. per lb. GLASGOW: 1s. 1d. per lb., 5%, ex store.

WHITE SUGAR OF LEAD.—£31 10s. per ton net.

ZINC SULPHATE.—Tech., £11 10s. f.o.r., in 2 cwt. bags.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 7d. to 1s. 2d. per lb., according to quality. Crimson, 1s. 6d. to 1s. 7½d. per lb.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARYTES.—£6 to £6 10s. per ton, according to quality.

CADMIUM SULPHIDE.—7s. to 7s. 3d. per lb.

CARBON BLACK.—4¾d. per lb., ex store.

CARBON DISULPHIDE.—£31 to £33 per ton, according to quantity, drums extra.

CARBON TETRACHLORIDE.—£41 to £46 per ton, according to quantity, drums extra.

CHROMIUM OXIDE.—Green, 10½d. to 11d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

INDIA-RUBBER SUBSTITUTES.—White, 4¾d. to 5½d. per lb.; dark 4d. to 4½d. per lb.

LAMP BLACK.—£24 to £26 per ton del., according to quantity. Vegetable black, £35 per ton upwards.

LEAD HYPOSULPHITE.—9d. per lb.

LITHOPONE.—30%, £16 10s. to £17 5s. per ton.

SULPHUR.—£9 to £9 5s. per ton. SULPHUR PRECIP. B.P., £55 to £60 per ton. SULPHUR PRECIP. COMM., £50 to £55 per ton.

SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quantity.

VERMILION.—Pale, or deep, 5s. per lb., 1-cwt. lots.

ZINC SULPHIDE.—£58 to £60 per ton in casks ex store, smaller quantities up to 1s. per lb.

Nitrogen Fertilisers

AMMONIUM SULPHATE.—The following prices have been announced for neutral quality basis 20.6% nitrogen, in 6-ton lots delivered farmer's nearest station up to June 30, 1938: November, £7 8s.; December, £7 9s. 6d.; January, 1938, £7 11s.; February, £7 12s. 6d.; March/June, £7 14s.

CALCIUM CYANAMIDE.—The following prices are for delivery in 5-ton lots, carriage paid to any railway station in Great Britain up to June 30, 1938: November, £7 10s.; December, £7 11s. 3d.; January, 1938, £7 12s. 6d.; February, £7 13s. 9d.; March, £7 15s.; April/June, £7 16s. 3d.

NITRO CHALK.—£7 10s. 6d. per ton up to June 30, 1938.

SODIUM NITRATE.—£8 per ton for delivery up to June 30, 1938.

CONCENTRATED COMPLETE FERTILISERS.—£11 4s. to £11 13s. per ton in 6-ton lots to farmer's nearest station.

AMMONIUM PHOSPHATE FERTILISERS.—£10 19s. 6d. to £14 16s. 6d. per ton in 6-ton lots to farmer's nearest station.

Coal Tar Products

BENZOL.—At works, crude, 9½d. to 10d. per gal.; standard motor, 1s. 3d. to 1s. 3½d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 8d. to 1s 8½d. GLASGOW: Crude, 10d. to 10½d. per gal.; motor, 1s. 4d. to 1s. 4½d.

CARBOLIC ACID.—Crystals, 7¾d. to 8½d. per lb., small quantities would be dearer; Crude, 60's, 3s. 9d. to 4s.; dehydrated, 4s. 4½d. to 4s. 7½d. per gal. MANCHESTER: Crystals, 8d. per lb. f.o.b. in drums; crude, 3s. 3d. per gal. GLASGOW: MANCHESTER: 4½d. to 5½d. GLASGOW: B.S.I. Specification,

CREOSOTE.—Home trade, 6½d. to 6¼d. per gal., f.o.r. makers' works; exports, 6¾d. to 6¾d. per gal., according to grade. MANCHESTER: 5¼d. to 6¼d. GLASGOW: B.S.I. Specification, 6d. to 6¼d. per gal.; washed oil, 5d. to 5½d.; lower sp. gr. oils, 5¾d. to 6¼d.

CRESYLIC ACID.—97/99%, 3s. 4½d. to 3s. 7½d.; 99/100%, 5s. to 5s. 6d. per gal., according to specification; Pale, 99/100%, 3s. 8½d. to 3s. 11½d.; Dark, 95%, 3s. to 3s. 1d. per gal. GLASGOW: Pale, 99/100%, 5s. to 5s. 6d. per gal.; pale, 97/99%, 4s. 6d. to 4s. 10d., dark, 97/99%, 4s. 3d. to 4s. 6d.; high boiling acids, 2s. to 2s. 6d. American specification, 3s. 9d. to 4s. MANCHESTER: Pale, 99/100%, 3s. 3d.

NAPHTHA.—Solvent, 90/160, 1s. 6¼d. to 1s. 7½d. per gal.; solvent, 95/160%, 1s. 7d. to 1s. 8d., naked at works; heavy 90/190%, 1s. 1½d. to 1s. 3d. per gal., naked at works, according to quantity. GLASGOW: Crude, 6½d. to 7¼d. per gal.; 90%, 160, 1s. 5d. to 1s. 6d., 90%, 190, 1s. 1d. to 1s. 3d.

NAPHTHALENE.—Crude, whizzed or hot pressed, £6 10s. to £7 10s. per ton; purified crystals, £15 10s. per ton in 2-cwt. bags. LONDON: Fire lighter quality, £5 10s. to £7 per ton. GLASGOW: Fire lighter, crude, £6 to £7 per ton (bags free). MANCHESTER: Refined, £17 per ton f.o.b.

PITCH.—Medium, soft, 35s. to 37s. per ton, f.o.b. MANCHESTER: 33s. f.o.b., East Coast. GLASGOW: f.o.b. Glasgow, 35s. to 37s. per ton; in bulk for home trade, 35s.

PYRIDINE.—90/140%, 13s. 6d. to 15s. per gal.; 90/160%, 10s. to 13s. 3d. per gal.; 90/180%, 3s. 3d. to 4s. per gal. f.o.b. GLASGOW: 90% 140, 10s. to 12s. per gal.; 90% 160, 9s. to 10s.; 90% 180, 2s. 6d. to 3s. MANCHESTER: 12s. 6d. to 14s. per gal.

TOLUOL.—90%, 1s. 10d. to 1s. 11d. per gal.; pure, 2s. 2d. to 2s. 3d. GLASGOW: 90%, 120, 1s. 10d. to 2s. 1d. per gal.

XYLOL.—Commercial, 2s. 1d. to 2s. 2d. per gal.; pure, 2s. 3d. to 2s. 4d. GLASGOW: Commercial, 2s. to 2s. 1d. per gal.

Wood Distillation Products

CALCIUM ACETATE.—Brown, £7 10s. to £8 per ton; grey, £9 10s. to £10. Liquor, brown, 30° Tw., 6d. to 8d. per gal. MANCHESTER: Brown, £9 10s.; grey, £11 10s.

METHYL ACETONE.—40.50%, £35 to £40 per ton.

WOOD CREOSOTE.—Unrefined, 4d. to 8d. per gal., according to boiling range.

WOOD NAPHTHA, MISCIBLE.—3s. 3d. to 3s. 6d. per gal.; solvent, 3s. 6d. to 3s. 9d. per gal.

WOOD TAR.—£2 to £8 per ton, according to quality.

Intermediates and Dyes

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.

BENZIDINE, HCl.—2s. 7½d. per lb., 100% as base, in casks.

BENZOIC ACID, 1914 B.P. (ex toluol).—1s. 11d. per lb. d/d buyer's works.

m-CRESOL 98/100%.—1s. 8d. to 1s. 9d. per lb. in ton lots.

o-CRESOL 30/31° C.—6½d. to 7½d. per lb. in 1-ton lots.

p-CRESOL, 34-5° C.—1s. 7d. to 1s. 8d. per lb. in ton lots.

DICHLORANILINE.—2s. 1½d. to 2s. 5½d. per lb.

DIMETHYLANILINE.—Spot, 1s. 7½d. per lb., package extra.

DINITROBENZENE.—8¼d. per lb.

DINITROCHLORBENZENE, SOLID.—£79 5s. per ton.

DINITROTOLUENE.—48/50° C., 9¼d. per lb.; 66/68° C., 11d.

DIPHENYLAMINE.—Spot, 2s. 2d. per lb., d/d buyer's works.

GAMMA ACID, Spot, 4s. 4½d. per lb. 100% d/d buyer's works.

H ACID.—Spot, 2s. 7d. per lb.; 100% d/d buyer's works.

NAPHTHIONIC ACID.—1s. 10d. per lb.

β-NAPHTHOL.—£97 per ton; flake, £94 8s. per ton.

α-NAPHTHYLAMINE.—Lumps, 1s. 1d. per lb.

β-NAPHTHYLAMINE.—Spot, 3s. per lb.; d/d buyer's works.

NEVILLE AND WINTHER'S ACID.—Spot, 3s. 3½d. per lb. 100%.

o-NITRANILINE.—4s. 3½d. per lb.

m-NITRANILINE.—Spot, 2s. 10d. per lb. d/d buyer's works.

p-NITRANILINE.—Spot, 1s. 10d. to 2s. 3½d. per lb. d/d buyer's works.

NITROBENZENE.—Spot, 4½d. to 5d. per lb., in 90-gal. drums, drums extra. 1-ton lots d/d buyer's works.

NITRONAPHTHALENE.—10½d. per lb.; P.G., 1s. 0½d. per lb.

SODIUM NAPHTHIONATE.—Spot, 1s. 11d. per lb.; 100% d/d buyer's works.

SULPHANILIC ACID.—Spot, 8¾d. per lb. 100%, d/d buyer's works.

o-TOLUIDINE.—11½d. per lb., in 8/10-cwt. drums, drums extra.

p-TOLUIDINE.—2s. per lb., in casks.

m-XYLIDINE ACETATE.—4s. 8d. per lb., 100%.

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Specifications Open to Public Inspection

MANUFACTURE OF AZO DYESTUFFS ON THE FIBRE.—E. I. du Pont de Nemours and Co. July 22, 1936. 20382/37.

TREATMENT OR PURIFICATION OF PRESSED, starchy, pectin-containing materials.—G. L. Baker. July 29, 1936. 848/37.

POLYMERISED NITRILES and processes of preparing the same.—Armour and Co. July 27, 1936. 10270/37.

HEAVY-HYDROCARBON CRACKING APPARATUS for internal-combustion engines.—Soc. Industrielle Hellenique des Gazofacteurs Berhoudar Soc. Anon. July 25, 1936. 10638/37.

MANUFACTURE OF STABILISED HYDROCARBON POLYMERS.—Standard Oil Development Co. July 25, 1936. 16136/37.

MANUFACTURE OF 2-ALKYLTETRAHYDROBENZTHIAZOLES and 2-alkyltetrahydrobenzselenazoles.—I. G. Farbenindustrie. July 29, 1936. 17351/37.

PROCESS FOR DYEING AND PRINTING ACETATE ARTIFICIAL SILK.—I. G. Farbenindustrie. July 25, 1936. 17947/37.

EMULSIFIER.—R. G. Gerber. July 29, 1936. 18246/37.

MANUFACTURE OF SOAP.—R. G. Gerber. July 29, 1936. 18247/37.

CEMENT OF THE PORTLAND TYPE.—Standard Oil Development Co. July 25, 1936. 19026/37.

PROCESS FOR THE CATALYTIC CONVERSION OF MIXTURES of carbonmonoxide and hydrogen.—Ruhrchemie, A.-G. July 27, 1936. 19431/37.

MANUFACTURE OF PRODUCTS comprising dextrose.—International Patents Development Co. July 31, 1936. 19793/37.

PROCESS FOR THE TREATMENT OF ORE or rock containing iron and titanium.—E. Scherf. July 30, 1936. 19947/37.

AROMATIC POLYETHER AMINES.—Rohm and Haas Co. July 31, 1936. 20051/37.

MANUFACTURE OF ACID WOOL DYESTUFFS.—I. G. Farbenindustrie. July 29, 1936. 20238/37.

MANUFACTURE AND PRODUCTION OF SYNTHETIC SPINELS.—I. G. Farbenindustrie. July 29, 1936. 20765/37.

DENSE NON-METALLIC ARTICLES.—Carborundum Co. July 28, 1936. 20816/37.

PROCESS FOR THE TREATMENT OF CELLULOSE ESTERS or cellulose ethers.—Soc. Rhodiaceta. July 31, 1936. 20905/37.

PROCESS FOR THE PURIFICATION OF WASTE LIQUORS.—E. Maier. July 29, 1936. 20916/37.

PROCESS FOR THE CONVERSION OF NORMALLY GASEOUS HYDROCARBONS.—Universal Oil Products Co. July 30, 1936. 20998/37.

MANUFACTURE OF SULPHURIC ACID DERIVATIVES OF IMIDAZOLINES.—E. Waldmann, and A. Chwala. July 29, 1936. 21008/37.

MANUFACTURE OF IMIDAZOLINES.—E. Waldmann, and A. Chwala. July 29, 1936. 21009/37.

BORONNITRIDE and methods of producing same.—British Thomson-Houston Co., Ltd. July 31, 1936. 21047/37.

METHODS OF PURIFYING HALOGENATED AROMATIC HYDROCARBONS.—British Thomson-Houston Co., Ltd. July 31, 1936. 21048/37.

MANUFACTURE OF ESTERS of compounds of the oestrone series. Soc. of Chemical Industry in Basle. July 30, 1936. 21080/37.

PREPARATION OF CELLULOSE ETHERS.—Dow Chemical Co. July 30, 1936. 21088/37.

MANUFACTURE OF ALIPHATIC ESTERS of the dihydro-oestrine series.—Soc. of Chemical Industry in Basle. July 30, 1936. 21148/37.

MANUFACTURE OF N : N'-dialkyl-dipyrazolanthronyls.—Soc. of Chemical Industry in Basle. July 30, 1936. 21153/37.

MANUFACTURE OF MOLECULAR COMPOUNDS.—I. G. Farbenindustrie. July 30, 1936. 21158/37.

Specifications Accepted with Dates of Application

EXTRACTING ALUMINA FROM BAUXITE.—T. R. Haglund. Oct. 23, 1936. 478,489.

SYSTEM OF OBTAINING AND TREATING CELLULOSE and product thereof.—Cellulose Research Corporation. April 24, 1935. 478,943; Sept. 4, 1935. 478,944.

MANUFACTURE OF CYANINE DYES, and their use in modifying the properties of photographic emulsions.—Kodak, Ltd., and B. Beilenson. April 24, 1936. (Samples furnished.) 478,945.

PROCESS FOR MAKING ACTIVE REGENERATABLE BLEACHING EARTHS from highly dispersed salt and fresh-water muds.—Planktokoll Chemische Fabrik Ges., and J. B. Carpzow. June 23, 1936. 479,023.

PROCESS FOR THE MANUFACTURE ON THE FIBRE of transformation products of dyestuffs containing sulphonic acid or carboxylic acid groups.—A. Carpmael (I. G. Farbenindustrie.) June 24, 1936. 478,953.

PRODUCTION OF TRANSPARENT COLOURS IN LACQUERS.—G. W. Johnson (I. G. Farbenindustrie.) June 25, 1936. 479,025.

PROCESS FOR TREATING FABRIC CONTAINING RUBBER THREAD.—T. L. Shepherd. June 26, 1936. 479,026.

PRODUCTION OF IRON AND STEEL.—Neunkircher Eisenwerke, A.-G. Vorm. Geb. Stumm, and J. Haag. June 24, 1936. 478,951.

REMOVAL OF ORGANICALLY-COMBINED SULPHUR from gases.—G. W. Johnson (I. G. Farbenindustrie.) July 21, 1936. 478,877.

MANUFACTURE OF ARTIFICIAL MATERIALS from polyvinyl chloride.—I. G. Farbenindustrie. July 26, 1935. 478,965.

MANUFACTURE OF AZO-DYESTUFFS.—I. G. Farbenindustrie. July 27, 1935. 478,966.

MANUFACTURE OF LUBRICANTS.—C. Ockrent, D. W. F. Hardie, and Imperial Chemical Industries, Ltd. July 27, 1936. 478,972.

PRODUCTION OF FINELY-DIVIDED CALCIUM CARBONATE.—A. H. Stevens (Pittsburgh Plate Glass Co.). July 30, 1936. 479,054.

PRODUCTION OF POLYVINYL RESINS.—Kodak, Ltd. Feb. 3, 1936. 479,057.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

BASSETT AND ROBERTS, LTD., London, E.C., oil refiners. (M., 12/2/38.) January 28, series of £1,000 debentures, present issue £500; general charge.

CHARNELL SOAP AND OIL CO., LTD., Manchester. (M., 12/2/38.) January 25, £700 debenture, to Reliance Manufacturing Co. (Blackley), Ltd.; general charge. *£700. August 3, 1937.

Satisfactions

CHARNELL SOAP AND OIL CO., LTD., Manchester. (M.S., 12/2/38.) Satisfaction January 28, £700, registered October 15, 1930.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Egypt.—The Egyptian Ministry of Public Health is calling for tenders, to be presented in Cairo by March 12, 1938, for the supply of 157.5 metric tons of disinfectant fluid for general purposes, and 9,000 kilos of disinfectant fluid for medical purposes. (Ref. T.Y. 17359/38.)

Egypt.—The Egyptian Prisons Administration is calling for tenders for the supply and delivery of 176,000 kgs. of cocoanut oil, 50,250 kgs. yellow sulphur oil, 25,000 kgs. olive oil, 17,000 kgs. of raw linseed oil, 6,000 kgs. palm oil, 77,500 kgs. hydrogenated fat (vegetable or animal industrial fat), 2,000 kgs. potassium carbonate 96/98 per cent., 9,250 kgs. solid caustic potash 88/90 per cent. (potassium hydroxide), 14,000 kgs. borax. Tenders should reach the Director-General of Prisons, Cairo, by March 16. A copy of the specifications and general conditions of tender may be inspected at the Department of Overseas Trade.

Portugal.—A firm of agents recently established at Lisbon wishes to obtain the representation, on a commission basis, of United Kingdom suppliers of tin in ingots. (Ref. No. 101.)

Switzerland.—A wholesale and import firm established at Brugg (Canton Aargau), wishes to obtain the sole agencies, on a commission or own account basis, of United Kingdom manufacturers and exporters of chemicals, drugs, pharmaceutical products and cosmetics; essences and oils (including peppermint) for sugar confectionery. (Ref. No. 102.)

Egypt.—A firm in Cairo wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of chemical and pharmaceutical products. (Ref. No. 105.)

Chemical and Allied Stocks and Shares

HOPES of more activity in the stock and share markets during the new Stock Exchange account have so far not been realised. The week-end news from Germany tended to keep sentiment under the influence of international affairs, while the increased unemployment figures also had an adverse influence. Consequently, there was a continuance of the downward movements in practically all sections, with the exception of British Government and other fixed interest-bearing securities. On balance declines in leading industrial shares amount in some cases to several shillings. Subsequently, however, the reduced prices attracted buyers, and moderate recovery was shown.

Shares of companies associated with the chemical and kindred trades moved closely with the surrounding trend of markets, but Imperial Chemical were reported to have a somewhat steadier appearance, and at 32s. 7½d. are within a few pence of the price ruling a week ago. It is realised that on the basis of the 8 per cent. dividend, which the market expects will be maintained for the past year, an apparently attractive yield is offered. Distillers have moved down from 102s. 6d. to 100s. 6d. at the time of writing, although the market is also continuing to look for the maintenance of the dividend in this case, granted the company does not have to face special additional taxation as a result of the Budget. Lever and Unilever ordinary were active on talk of a higher payment for the past year, and at 37s. 6d. are within 6d. of the figure current a week ago.

Swedish Match fluctuated moderately. In some quarters the view is being expressed that dividends may be resumed this year. This is not generally anticipated, however, although it is being assumed that the report and accounts will probably show encouraging improvement in earnings and the financial position. British Match were steady at 35s. 4½d., and are one of the few industrial shares which are around the highest price touched in the current year to date. On the basis of the 7¼ per cent. dividend paid for the previous year, the yield is on the small side, but this reflects hopes that a larger dividend will be announced next month. Some market men, however, assume that it is the intention of directors eventually to distribute a bonus of some kind, and that in that event it may be decided not to increase the cash dividend.

Borax Consolidated have declined from 29s. 6d. to 27s. 7½d., but are now "ex" the 10 per cent. dividend. The latter is shown by the full results to be covered by a good margin of profits, and, among other things, it is stated that the investment in the United States Potash Co. is yielding a substantial return. The market is talking of the possibility that it may be announced it is the intention to resume payment of an interim dividend this year.

Courtaulds have moved down on balance from 45s. to 42s. 9d., and have continued to fluctuate rather sharply, pending the dividend announcement. British Celanese shares were reactionary, partly owing to the view current in some quarters of the market, that it may be decided to reorganise the capital to permit of regular dividend payments in future. This view is, however, entirely without confirmation. Movements in textile shares generally were, in fact, adverse to holders owing to the prevailing market tendency.

Iron and steel shares have also been lowered sharply in price, although later on the yields offered brought in buyers. Baldwins were inclined to improve on the hope that the payment for the year may be moved up to from 10 per cent. to 12½ per cent., while there was a steadier tendency in Vickers, partly because the impending results of the English Steel Corporation are expected to create a very good impression. Dorman Long at 30s., has a steadier appearance than of late, and Stewarts and Lloyds at 35s. have made some recovery from an earlier decline.

Pinchin Johnson at 34s. have moved down sharply, although the market is continuing to budget for the maintenance of the 20 per cent. dividend on the enlarged capital. Associated Portland Cement are 85s. 6d. at the time of writing, compared with 86s. 3d. a week ago. Oil shares reacted to lower levels, sentiment still being under the influence of the possibility of reduced oil and petrol prices if there is no early recovery of general trade conditions in the United States.

Company News

International Nickel Co. of Canada announces a dividend on the common shares of 50 cents per share. In each quarter of 1937 50 cents per share was paid; in the final quarter there was also an extra payment of 25 cents per share.

English China Clays, Ltd., has decided to pay a dividend of 3½ per cent., less tax, for the year ended December 31. This compares with 2 per cent. in 1936 and ½ per cent. in 1935. Of the authorised capital of £2,000,000, an amount of £1,895,661 has been issued. This is divided into £399,070 in 7 per cent. cumulative preference shares and £1,496,591 in ordinary shares of £1. The company in their report for 1937 states that dividends received or receivable from English Clays Lovering Pochin and Co., were £80,371 (£58,376) and, after adding rents and interest received and deducting expenses, there remains a profit of £82,209 (£59,736).

Fescol, Ltd., electrodepositors of metal, owing to the interruption of business caused by fire in December last, which will necessarily affect the turnover for the current year, consider it advisable to defer dealing with the company's capital structure, and the options on the unissued ordinary shares, until the results of the current year's trading are available in November next.

Redfern's Rubber Works, in their report for 1937 show profit £32,169 (£28,068); add balance brought forward £13,396, making £45,565; less provision for income-tax £732 (£1,926); N.D.C. £1,250 (nil); to raw materials reserve account £5,000 (nil); to employees' pension fund £1,259 (£1,403); final dividend of 12½ per cent. on ordinary shares, making 17½ per cent. (same); £14,324 forward.

Borax Consolidated, Ltd., continued to make good progress in the year to September 30 last. The report shows that trading profits have expanded from £427,820 to £458,775, and other income from £32,871 to £103,149. Total income is thus up by £101,234 to £561,925. The provision for depreciation is increased by £10,000, to £70,000, and tax, which this time includes N.D.C., takes £32,000, against £20,000, leaving the net profits at £260,909, compared with £181,202, an increase of £79,707.

New Companies Registered

J. F. White & Co., Ltd. 336,189.—Private company. Capital, £11,000 in 11,000 shares of £1 each. To acquire the business of manufacturing chemists and patent medicine proprietors carried on by the trustees of the will of F. A. White, deceased, and Jas. F. White at Lovington Street, Leeds, as "J. F. White and Co." Subscribers: J. F. White, Gledholt, Oakwood Grove, Leeds, 8; H. S. Wainwright.

Dr. Maurer's Laboratories, Ltd. 336,176.—Private company. Capital, £100 in 2,000 shares of 1s. each. To carry on the business of manufacturers of and dealers in any product connected with the manufacture and/or use of chemicals, chemical foods and medicines, etc. Directors: Fredk. J. Surridge, 101 Hartley Down, Purley; Wm. Penny, Eduard Maurer. Registered office: 90 Fenchurch Street, E.C.3.

Chemical and General Distributors, Ltd. 336,558.—Private company. Capital £3,000 in 3,000 shares of £1 each. To acquire the business of a manufacturer, merchant and general commission agent carried on by F. N. V. Winckler at Imperial House, 80-86 Regent Street, W.1. Directors: Francis N. V. Winckler, 22a Cygnet House, King's Road, Chelsea, S.W.; Yvonne M. H. Ignatieff, Edmund F. Norman, Joseph G. Osipoff. Registered office: 80-86 Regent Street, W.1.

British Rodent Exterminator Company, Ltd. 336,164.—Private company. Capital £100 in 500 shares of 4s. each. To acquire the business of manufacturers of rat poison carried on by S. C. Springett, B. Castle, W. C. Johnson and C. H. Scarborough. Directors: Chas. H. Scarborough, 436 Streatham High Road, S.W.16; Wm. Chas. Johnson, Berkeley E. Castle, Stanley C. Springett. Registered office: 67 Vicarage Road, Plumstead, S.E.18.

Anglo-French Carbonisation, Ltd. 336,552.—Private company. Capital £1,000 in 100 shares of £10 each. To search for, raise and work coal, iron ore, tin, zinc, copper, lead, clay, gold, silver and other minerals, ores and deposits; to exploit a process of low temperature carbonisation of coal and the special briquetting of coal, etc. Subscribers: Adolphus Borchardt, Dr. LL., 21 Manchester Street, W.1; Sylvia West.

Forthcoming Events

February 21-March 4.—British Industries Fair at Olympia and Earl's Court, London, and Castle Bromwich, Birmingham.

London.

February 14.—University College, Gower Street, W.C.1. 5 p.m. Dr. H. R. Ing, "Chemical Structure and Pharmacological Action."

Institution of the Rubber Industry. The Royal Empire Society, Northumberland Avenue, W.C.2. 7.30 p.m. W. H. Reece, "Calendering Practice."

February 15.—Institute of Civil Engineers. Great George Street, Westminster, S.W.1. 6 p.m. H. J. Gough, and W. A. Wood, "The Deformation and Fracture of Metals."

February 16.—Society of Glass Technology. London School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, W.C.1. 7.30 p.m. Dr. C. Ainsworth Mitchell, "Some Recent Advances in the Scientific Examination of Documents."

February 17.—The Chemical Society. Burlington House, Piccadilly, W.1. 8 p.m. Professor A. Findlay, The Franklin Memorial Lecture.

Royal Institution of Great Britain, 21 Albemarle Street, W.1. 5.15 p.m. H. W. Melville, "The Mechanism of Gaseous Chemical Reactions."

February 18.—Institution of Chemical Engineers. Sixteenth Annual Corporate Meeting. 11 a.m. 2.15 p.m. Dr. H. J. Bush, "Some Applications of Electrical Precipitation to Industrial Effluent Gases." 7 p.m. Annual Dinner. Hotel Victoria, Northumberland Avenue, W.C.2.

February 21.—University College, Gower Street, W.C.1. 5 p.m. Dr. H. R. Ing, "Chemical Structure and Pharmacological Action."

University of London. Imperial College of Science and Technology, Imperial Institute Road, South Kensington, S.W.7. 5.15 p.m. Dr. W. P. Jorissen, "Reactions in Gaseous and Solid Mixtures."

Birmingham.

February 14.—The Chemical Society and Birmingham University Chemical Society. University, Edgbaston. 5 p.m. Lecture by Professor I. M. Heilbron.

February 17.—The Society of Chemical Industry. Chamber of Commerce Buildings, New Street. 7.30 p.m. Late F. R. O'Shaughnessy and S. J. Roberts, "Some Further Considerations on the Oxidation of Sewage."

Bristol.

February 17.—Institute of Chemistry. University, Woodland Road. 5.30 p.m. Dr. P. Lewis-Dale, "The Work of the Railway Chemist."

Belfast.

February 15.—Institute of Chemistry. Belfast and District Section, Queen's University. Dr. C. L. Wilson, Dr. S. Andrews and others. Symposium on Micro-Chemical Methods.

Derby.

February 22.—British Association of Chemists. Cavendish Café, Derby. Messrs. Sowter and Stanbridge, "Paper Making" and "New Artificial Silicates."

Glasgow.

February 18.—Society of Chemical Industry. Joint Meeting with the Glasgow Chemical Societies. Royal Technical College. 7.30 p.m. Professor H. V. A. Briscoe, "The Chemical Examination of Dust Causing Silicosis."

Hull.

February 15.—Hull Chemical and Engineering Society. Municipal Technical College, Park Street. 7.45 p.m. A. R. Tankard, "The Work and Ideals of a Public Analyst."

Liverpool.

February 16.—British Association of Chemists. Constitutional Club, India Buildings. Section Meeting. 7.30 p.m.

February 18.—Society of Chemical Industry. The University, Liverpool. 6 p.m. Joint Meeting with the Manchester Section. Dr. E. B. Maxted, "Some Aspects of Catalysis."

Manchester.

February 14.—The Institute of the Plastics Industry. Engineers' Club, 17 Albert Square. 7.15 p.m. F. H. J. Mills, "The Borderline between Unit and Multi-impression Moulding."

Newcastle.

February 15.—Institute of Civil Engineers. Newcastle-upon-Tyne and District Association. The North of England Institute of Mining and Mechanical Engineers, Westgate Road. 7.30 p.m. J. W. Shiell, "Sewage Disposal."

February 18.—The Chemical Society. King's College. 7.30 p.m. Scientific Meeting.

February 22.—N.E. Joint Chemical Societies' Dinner.

Sheffield.

February 16.—Society of Glass Technology. The University, St. George's Square. 2 p.m. A. J. Holland and Eric Preston, "The Microscopical Examination and Identification of Crystalline Products in Commercial Glasses," and W. B. Mitchell, "The Mechanical Pressing of Glass."

February 18.—The Chemical Society. The University. 5.30 p.m. Professor N. V. Sidgwick, "Multiple Links."

Stourbridge.

February 14.—Society of Glass Technology. Talbot Hotel. 7.30 p.m. J. H. Hogan, "Stained Glass."